JUN 14 1926

June 12, 1926

McGraw-Hill Publishing Company, Inc.

Price Twenty-five Cents Per Copy

ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

In the Furnace Room of the Monterey Smelter's Assay Office

Monterey: Smelting and Industrial Center of Mexico
By Arthur Barrette Parsons

Engineering Principles Applied to Exploitation of a Clay Deposit
By C. N. Schuette

Biography of Carmi A. Thompson
E. & M. J. Statistics of the Mining Industries
The Situation at the Mines
Useful Operating Ideas

Mining Stocks—Week Ended May 29, 1926

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Anaconda	New York	46	45	45½	Ap.17, My.24	0.75
Arcadian Consol.	Boston	*80	*65	*75		
Ariz. Com'l	Boston	10	9¼	9¼	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	...	...	1½		
Calumet & Arizona	New York	60⅜	59¾	60	Jn. 4, Jn. 21 Q	1.50
Calumet & Hecla	Boston	14⅞	14½	14⅝	Jn. 1, Jn. 15 Q	0.50
Cerro de Pasco	New York	63⅜	62½	62½	Ap. 15, My. 1, Q	1.00
Chile Copper	New York	32⅜	32	32½	Jn.2, Jn.28, Q	0.62½
Chino	New York	20⅜	20⅛	20⅛	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	3	2⅞	3		
Copper Range	Boston	14¼	13	14¼	May, 1925	1.00
Crystal Copper	Boston Curb	*32	*25	*31		
East Butte	Boston	2¼	2¼	2¼	Dec., 1919	0.50
First National	Boston Curb	*17	*16	*17	Feb., 1919	0.15
Franklin	Boston	*40	*40	*40		
Granby Consol	New York	19⅜	19	19⅛	May, 1919	1.25
Greene-Cananea	New York	11⅛	10⅛	11⅛	Nov., 1920	0.50
Hancock	Boston	*50	*50	*50		
Howe Sound	New York	33⅜	32½	33⅜	Ap.1, Ap.15	0.75
Inspiration Consl.	New York	22⅜	21⅜	22⅛	Jn.7, Jy.6, Q	0.50
Iron Cap	Boston Curb	3⅜	3½	3⅜	Jn. 1, Jn. 15	0.50
Isle Royale	Boston	10½	10	10	Jn. 1, Jn. 15	0.50
Jerome Verde Dev	N. Y. Curb	...	...	*55		
Kennecott	New York	53⅛	53⅛	53⅝	Jn. 4, July 1 Q	1.00
Lake Copper	Boston	...	...	*75	June, 1925	0.50
Magma Copper	New York	36½	36	36½	Mh.31, Ap.15, Q	0.75
Mason Valley	N. Y. Curb	1⅜	1⅜	1⅜		
Mass Consolidated	Boston	...	...	*25	Nov., 1917	1.00
Miami Copper	New York	11⅜	11⅛	11⅜	My. 1, My. 15 Q	0.25
Mohawk	Boston	31⅛	30½	31⅛	My. 1, Je. 1 Q	1.00
Mother Lode Coa	New York	6½	6	6	De. 11, De. 31	0.37½
Nevada Consol	New York	12⅛	11⅞	12⅛	Mh.18, Mh.31 Q	0.25
New Cornelia	Boston	19⅜	19⅛	19⅜	My.7, M.24 Q	0.40
North Butte	Boston	2⅛	2 1/16	2⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*60	*57	*60	No. 14, De. 2	0.05
Old Dominion	Boston	15⅛	14	15⅛	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†169	†159		Mar.20, Apr.20 Q	1.00
Quincy	Boston	17	15⅞	16⅛	Mar., 1920	1.00
Ray Consolidated	New York	12⅝	12⅛	12⅜	Ap.20, Ap.30	0.25
Ray Hercules	N. Y. Curb	...	...	11⅞		
St. Mary's Min. Ld.	Boston	26⅛	25⅛	26⅛	Ap.17, My.18	2.00
Seneca Copper	New York	5	5	5		
Shannon	Boston	*45	*35	*40	Nov., 1917	0.25
Superior & Boston	Boston	*80	*75	*75		
Tenn. C. & C.	New York	12⅛	11⅛	11⅝	My. 29 Ju. 15, Q	0.25
United Verde Ex	N. Y. Curb	27⅛	27⅛	27⅛	Ap.6, My.1,	0.75
Utah Copper	New York	100	98	100	Mh.18, Mh.31, Q	1.25
Utah Metal & T	Boston	1⅜	1⅛	1⅜	Dec., 1917	0.30
Victoria	Boston	*45	*40	*40		
Walker Mining	Salt Lake	*55	*45	*51		
NICKEL-COPPER						
Internat. Nickel	New York	36¼	33⅞	35⅞	My.11, My.31, Q	0.50
Internat. Nickel, pfd.	New York	...	...	104	Ap.15, My.1, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*31⅛	*31	*31⅛	Ja. 1, Ja. 10 M	0.0⅛
National Lead	New York	148¾	146¼	148¾	Jn. 11, Jn. 30 Q	2.00
National Lead pfd.	New York	118	118	118	My.21, Je.15 Q	1.75
St. Joseph Lead	New York	40	38⅛	39⅞	Jc.10, Je. 21 QX	0.75
ZINC						
Am. Z. L. & S	New York	7⅛	6⅞	7⅛	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	31⅞	25	31	Nov., 1920	1.50
Butte C. & Z	New York	4⅞	4⅜	4⅜	De.10, De.24	0.50
Butte & Superior	New York	9¼	8⅞	9⅛	Ma.15, Ma.31 Q	0.50
Callahan Zn-Ld	New York	2	1⅞	1⅞	Dec., 1920	0.50
Eagle Picher	Cincinnati	...	...	26⅛	My. 15, Jn.1	0.40
Eagle Picher, pfd.	Cincinnati	110	110	110	Mh.31, Ap.15 Q	1.50
New Jersey Zn	N. Y. Curb	...	...	208	Jn.9, Jy.10 Q	2.00
United Zinc	N. Y. Curb	...	...	*70		
Yellow Pine	Los Angeles	*26	*26	*26	De.8, De.18 Q	0.04
GOLD						
Alaska Juneau	New York	1⅜	1⅜	1⅜		
Argonaut	Toronto	*25	*23½	*23½		
Barry-Hollinger	Toronto	*47	*41	*43		
Carson Hill	Boston	*30	*26	*26		
Consol. W. Dome L.	Toronto	*15	*14	*14½		
Cresson Consol. G.	N. Y. Curb	2⅛	2⅛	2⅛	Mh.31, Ap.10	0.10
Crown Reserve	Toronto	*11½	*10	*11	Jan., 1917	0.05
Dome Mines	New York	14⅜	13⅞	14⅛	Jn.30, July 20, Q	0.50
Golden Center	N. Y. Curb	2⅛	2⅛	2⅛		
Golden Cycle	Colo. Springs	1.52	1.51½	1.51	No.30, Dec.10 Q	0.03
Hollinger Consol.	Toronto	19.25	19.00	19.25	Ju. 1, Jn. 17	0.08
Homestake Mining	New York	53	52½	52½	My.20, My.25 M	0.50
Kirkland Lake	Toronto	1.13	1.09	1.10		
Lake Shore	Toronto	11.40	10.35	11.20	Ju.1, Jn. 15 Q	0.10
McIntyre-Porcupine	New York	...	...	25½	My.1, Je.1	0.25
Newray	Toronto	*35	*35	*35		
Night Hawk Pen.	Toronto	*7½	*7	*7½		
Noranda	N. Y. Curb	15⅜	15⅛	15⅜		
Portland	Colo. Springs	*50	*46	*50	Apr.6, Apr.15	0.02
Rand Mines	New York	...	...	32½	Fe.16, Fe.26	1.52
Teck-Hughes	Toronto	3.49	3.38	3.49	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	*70	*67½	*70	Ma.10 Ma.20	0.02
Tough-Oakes	Toronto	*39½	*38	*38		
United Eastern	N. Y. Curb	...	...	*35	July, 1924	0.05
Vipond Cons	Toronto	1.63	1.58	1.63		
Wright-Hargreaves	Toronto	8.45	8.10	8.45	Ju.15, Jy.1 Q X	0.07½
Yukon-Alaska Trust	N. Y. Curb	...	...	21½		
GOLD AND SILVER						
Carnegie Metals	Boston	17	17	17		
Con. Cortez	N. Y. Curb	...	...	*5		
Con. Virginia	San Francisco	*8	*6½	*6½		
Continental Mines	N. Y. Curb	...	...	*45		
Dolores Esperanza	N. Y. Curb	*53	*43	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2½	2 7/16	2⅜	Jn.18, Jy.3 Q	0.08
Tonopah Belmont	N. Y. Curb	3¼	1 2/16	3¼	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	*56	*56	*56	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	5⅛	5⅛	5⅛	Ap.7, Ap.21 Q	0.07½
Unity Gold	N. Y. Curb	...	...	*20		
West End Consol.	N. Y. Curb	*25	*25	*25	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	...	...	*45	June, 1918	0.02

Stock	Exch.	High	Low	Last	Last	Div.
SILVER						
Alvarado	N. Y. Curb	...	...	1	Oct., 1920	0.50
Beaver Consol	Toronto	*73¾	*70	*70	May. 1920	0.03
Castle-Trethewey	Toronto	1.38	1.35	1.37		
Coniagas	Toronto	...	...	3.75	May, 1924	0.12½
Keeley	Toronto	1.51	1.39	1.40	Ma.1, Ma.15 X	0.12
Kerr Lake	N. Y. Curb	1⅛	1⅛	1⅛	Ap.1, Ap.15	0.12½
La Rose	Toronto	*11	*10¾	*10¾	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	...	...	*85	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*19¾	*18	*18½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.47	3.40	3.45	Ja. 16, Ja. 30	0.12½
Nipissing	N. Y. Curb	5⅛	5⅛	5⅛	Mh.31, Ap.15, Q	0.15
Temiskaming	Toronto	*12½	*12	*12	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	8⅛	8	8⅛	Jn.18, Jy.5, Q X	0.25
Alta Merger	Salt Lake	†*5½	†*2½	...		
Bingham Mines	Boston	32⅜	31	31	Ma.20, Ma.31 Q	1.00
Cardiff M. & M.	Salt Lake	*53	*47½	*50	De.16, No.18	0.10
Chief Consol	Salt Lake	...	...	2.90	Ap.1, My.1 Q	0.10
Emma Silver	Salt Lake	†*50	†*25	...		
Erupcion	Boston Curb	1⅜	1 7/16	1⅜	Jn.18, Jy 5, QX	0.10
Federal M. & S.	New York	56	41⅞	56		
Federal M. & S., pfd.	New York	72	70	70	My.25, Ju.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*26	*22·	*22		
Hecla Mining	N. Y. Curb	16⅜	16	16⅛	My.15, Je.15 Q	0.50
Iron King Mining	Salt Lake	*20	*20	*20		
Keystone Mining	Salt Lake			*43	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*14¼	*14¼	*14¼		
Mammoth Mining	Salt Lake	...	...	2.77½	Mar.24, Apr.1	0.10
Marsh Mines	Spokane	*3⅜	*3⅛	*3⅜	Se.15, Oc.1	0.15
Park Utah	Salt Lake	6.00	5.95	5.95	Mh.15, Ap.1	0.15
Prince Cons	Salt Lake	3.50	3.01	3.01		
Silver King Coal	Salt Lake	7.80	7.65	7.80	Mh.20, Ap.1, Q	0.25
Silversmith	Spokane	*49	*48½	*48½	Apr.1, Apr.10	0.02
Tamarack-Custer	Spokane	*37	*36	*36	Sept., 1924	0.25
Tintic Standard	Salt Lake	12.37½	12.25	12.25	Mh.1, Mh.20, QX	0.40
Utah-Apex	Boston	8⅛	8⅛	8⅛	Apr. 9, Apr. 15	0.25
Western Utah Copper	N. Y. Curb	...	...	*8		
IRON						
Betnlehem Steel	New York	40⅜	38	39⅛	July, 1924	1.25
Colorado Fuel & Iron	New York	41⅛	38⅛	40⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	19⅞	19⅛	19⅜	De. 4, De. 28,	0.75
Inland Steel	New York	38½	36⅛	38½	My.10, Je.1 Q	0.75
Mesabi Iron	N. Y. Curb	1⅜	1⅜	1⅜		
Replogle Steel	New York	10⅛	9½	10		
Republic I. & S.	New York	49⅞	46⅝	49	May. 1921	1.50
Republic I. & S. pfd.	New York	92½	92	92½	Jn.15, July1, Q	1.75
Sloss-Sheffield S. & I.	New York	127¼	121¾	126	Jn.10, Jn 1 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	104⅛	104⅛	104⅛	Jn 21, July 1, Q	1.75
U. S. Steel	New York	125	121⅛	125	Jn.2, Jn 29 Q	1.75
U. S. Steel pfd	New York	128	127⅛	127⅜	My.4, My.29, Q	1.75
Virginia I. C. & C.	New York	46⅞	43	46⅞	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	...	...	73	Jn.1, July 2,	2.50
ALUMINUM						
Alum. Co. of Amer.	Open Market	64⅞	64⅜	64⅞		
Alum. Co. of Amer pf.	Open Market	99½	99½	99½	April, Q	1.50
VANADIUM						
Vanadium Corp.	New York	35⅜	34⅛	34⅛	My.1, My.15, Q	0.75
ASBESTOS						
Asbestos Corp., New	Montreal	24⅛	23	23⅛	De.31, Ja.15 Q	1.50
Asbestos Corp., pfd.	Montreal	76½	75½	75¼	De.31, Ja.15, Q	1.50
SULPHUR						
Freeport Texas	New York	34⅜	32⅜	33½	Nov., 1919	1.00
Texas Gulf	New York	138½	134¾	137½	Jn.1, Jn. 15, Q	2.50
DIAMONDS						
De Beers Consol	New York	...	...	27⅛	Ja.26, Fe.2	0.23
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅜	4⅛	4⅜		
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	50	49	50	My.20, Je.1, Q	1.00
Amer. Metal pfd	New York	...	...	113½	My.20, Je.1 Q	1.75
Amer. Sm. & Ref.	New York	119½	115¾	118¾	Ap.16, My.1, Q	1.75
Amer. Sm.&Ref.pfd.	New York	117⅛	116⅛	117⅜	My.7, Je.1, Q	1.75
Consol. M. & S.	N. Y. Curb	...	...	208	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb	17½	17½	17½		
Newmont Mining	N. Y. Curb	52½	52	52⅜	Mar.31, Apr.15,	0.60
Southwest Metals	N. Y. Curb	...	...	2		
U. S. Sm. R. & M.	New York	39	37⅜	38	Ap.8, Ap.15, Q	0.87½
U. S. Sm. R.&M.pfd.	New York	49	48⅛	48⅛	Ap.8, Ap.15, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED MAY 18th, 1926

Name	High	Low	Last	Last Divd Date	Amount
Aramayo Mines (25 frs.)	.....	.....	80/—	May. 1926	5 p.c.†
British Platinum (£1)	.....	.....	6/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	.....	.....	15/4½	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	.....	.....	7/6		
Camp Bird (£1)	.....	.....	5/3		
El Oro (£1)	.....	.....	6/3	Nov. 1924	2½ p.c.*
Esperanza (10s)	.....	.....	1/6		
Frontino & Bolivia (£1)	.....	.....	8/3	Jan. 1926	1¼ p.c.
Mexican Corpn. (£1)	.....	.....	17/—		
Mexico Mines of El Oro (£1)	.....	.....	30/—	Dec. 1925	12½ p.c.*
Oroville Dredging (£1)	.....	.....	3/9	Dec. 1923	3¾ p.c.
Ouro Preto (£1)	.....	.....	2/6	May 1925	2½ p.c.
Rhodesian Congo Border	.....	.....	103/—		
St. John del Rey (£1)	.....	.....	8/3	June 1925	6¼ p.c.
San Francisco Mines (10s)	.....	.....	27/9	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	.....	.....	21/3	July 1920	5 p.c.
Selukwe (2s. 6d.)	.....	.....	11/6	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	.....	.....	4/6	Nov. 1917	75 p.c.
Tanganyika (£1)	.....	.....	39/4½	Sept. 1925	5 p.c.
Tomboy (£1)	.....	.....	3/6	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.750	6.750	6.750	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.

Volume 121 New York, June 12, 1926 *Number* 24

ENGINEERING AND MINING JOURNAL-PRESS

J. E. SPURR, Editor

GEORGE J. YOUNG, Associate Editor, San Francisco, Calif. T. A. RICKARD, Contributing Editor, San Francisco, Calif.
A. H. HUBBELL, Managing Editor
E. H. ROBIE, A. B. PARSONS, ALBERT H. FAY, W. N. P. REED, Assistant Editors
Tenth Ave. at 36th St., New York, N. Y.
883 Mission St., San Francisco, Calif. Colorado Building Washington, D. C.

Contents

*Illustrated Article

Editorials 953
- A One-Man Board of Tax Appeals
- Mechanical Loading
- War Minerals Relief
- Stream Pollution by Mine Waters
- The Kentucky-Illinois Fluorspar Field
- An Outlet for Copper in Agriculture
- Mosul and Oil
- Vacations for Mining Men

***Mining Men of Note** 956
Colonel Carmi A. Thompson

***Monterey: Smelting and Industrial Center of Mexico** 957
By Arthur Barrette Parsons

***Engineering Principles Applied to Exploitation of a Clay Deposit** 964
By C. N. Schuette

***Useful Operating Ideas** 969
- *Rehabilitating an Air Compressor
- *Rope Guide for Idler Sheaves

Discussion 971
- The Wolf in Sheep's Clothing
- Suppose Coon Butte Be Made a Testing Ground for Mineral-Location Devices
- The Ruling Habit
- Too Much Open Forum?
- Credit to James Swinburne
- The Selenium Supply
- Iodine and Goiter

Consultation 972
- Sperrylite: An Arsenide of Platinum
- Authorities on Mining Law
- Who Produced the World's Copper in 1925?

Mining News 974
- Exploration Work at Red Lake
- Sale of Westfield Lead Prohibited
- Sonora Mines Active
- Revival of Silver-Lead Mines in Montana
- Manganese Mining in New Mexico
- Washington News
- Letters from London and Johannesburg

Situation at the Mines 981

Societies, Addresses and Reports 982

Men You Should Know About 983

Obituaries 983

Recent Technical Publications 984

New Machinery 985

Markets 987

Index Curves of Metal Prices 989

Review of Current Statistics 990
By Arthur Barrette Parsons

Statistics—Curves and Metal Prices 991

Mining Stocks 992

Searchlight Section 38-41

Professional Directory 43

What and Where to Buy 46

Advertising Index 50

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., New York, N. Y.

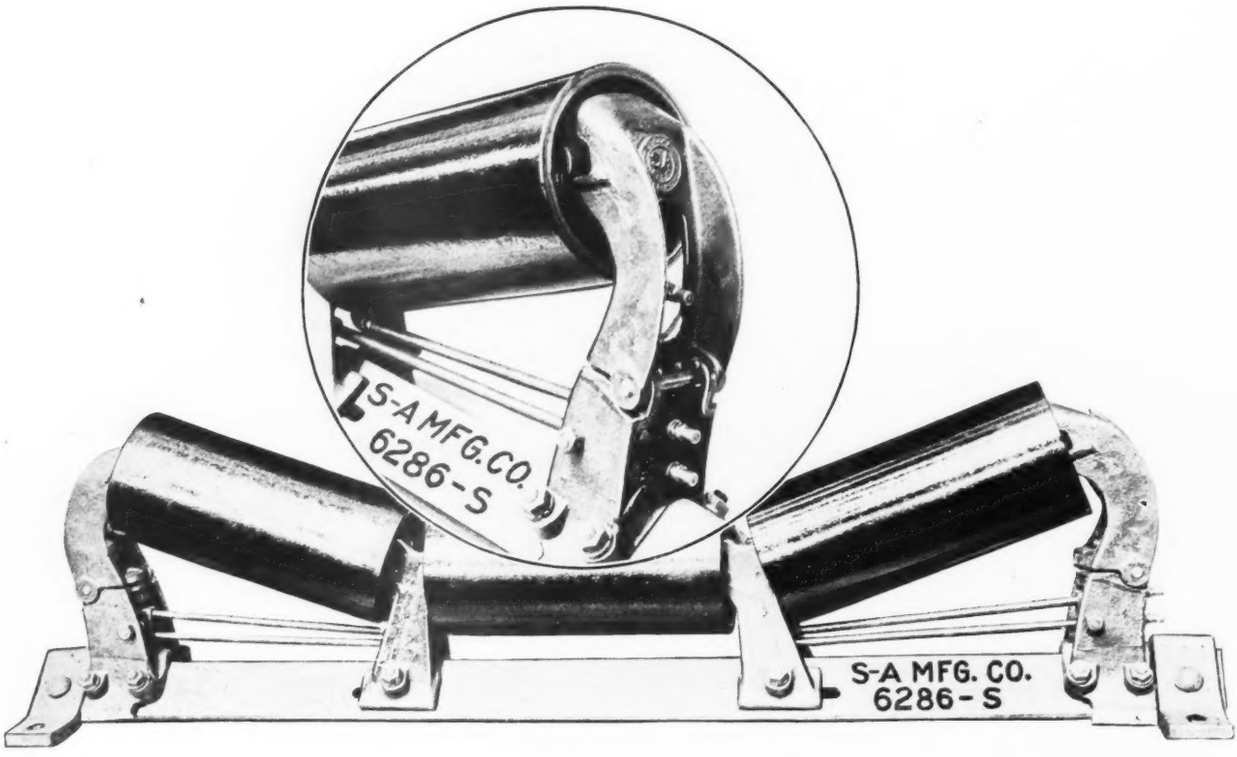
JAMES H. McGRAW, President
JAMES H. McGRAW, Jr., Vice-Pres. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary

WASHINGTON, Colorado Building
CHICAGO, 7 S. Dearborn Street
PHILADELPHIA, 16th and Parkway
CLEVELAND, Guardian Building
ST. LOUIS, Star Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie St., London, E. C. 4

Cable Address: "Machinist, N. Y."
Copyright 1926
By McGraw-Hill Publishing Company, Inc.
Publishers of
Engineering News-Record American Machinist
Power Chemical and Metallurgical Engineering
Coal Age Engineering and Mining Journal-Press
Ingeniería Internacional
Electrical World Electrical Merchandising
Bus Transportation Electric Railway Journal
Industrial Engineer Radio Retailing
Successful Methods
Journal of Electricity
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

The annual subscription rate in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Chili, Haiti and Paraguay, $5 per year. Extra foreign postage, $3 (total $8 or 34 shillings). Single copy, 25c. Change of Address—When change of address is ordered the new and the old address must be given. Notice must be received at New York at least ten days before the change takes place. Published weekly. Entered as second-class matter June 20, 1879, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.
Member Audit Bureau of Circulations.
Member Associated Business Papers, Inc.

11,720 COPIES PRINTED THIS ISSUE



Belt conveyors — the modern handling method

Mechanical conveying is everywhere displacing different forms of transporting ore and other bulk materials, and more and more mines and mills are installing belt conveyors for work formerly handled in other ways.

Operating as they do with low power consumption and with long belt life, S-A belt conveyors transport materials at the very lowest cost per ton.

Only a short time ago Stephens-Adamson Mfg. Co. designed and built a conveyor system over four miles in length!

The Sacon Carrier shown above is one of the types of S-A ball-bearing, high-pressure lubricated carriers which are noted for durability, smooth, easy turning rolls, and long service life.

The illustration above shows a Sacon Carrier, specially equipped with outside lubrication fittings.

S-A Chains

Chains of every variety for elevating and conveying service, from smallest hand chain to mammoth steel bushed roller chain, listed in S-A Catalog No. 27.

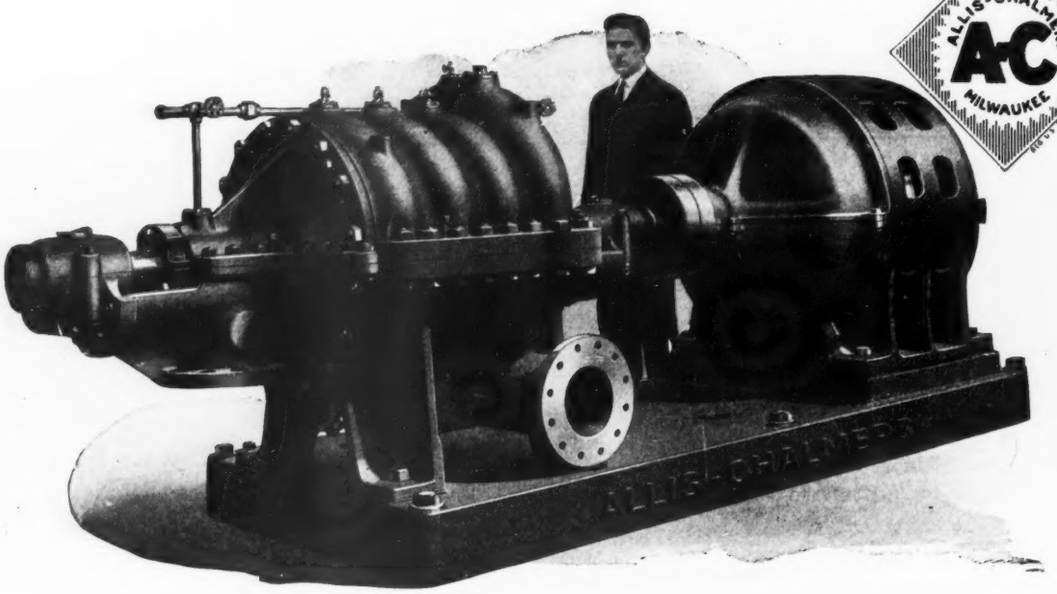
Stephens-Adamson Mfg. Co.

AURORA, ILLINOIS

Pacific Coast Factory—Los Angeles, Cal.

STEPHENS-ADAMSON

S-A BELT CONVEYORS



REPEAT ORDERS

This advertisement is written by a satisfied user of Allis-Chalmers multi-stage centrifugal pumps

"In April, 1919, we ordered from you three (3) 4-in., 5-stage centrifugal pumps, each direct connected to 150 H.P. induction motor of your make.

This equipment proved such an improvement over our old installation that we ordered, in June the same year, five (5) more of these units.

In July, 1920, we ordered four (4) more pump units with two-hundred horsepower motors, and an additional unit in December of the same year. I take pleasure in advising you that these units have given excellent service. You can see from the repetition of orders that we are well satisfied with the equipment."

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 121 New York, June 12, 1926 *Number* 24

A One-Man Board of Tax Appeals

SIXTEEN APPOINTMENTS were made recently to complete the personnel of the Federal Board of Tax Appeals, effective as of June 1, 1926. The board, which handles natural resources tax cases, as well as others, has been functioning nearly two years with a trained and experienced staff. Two of the men, Albert E. James and A. E. Graupner, who had been on the board for several months, were not reappointed, but new men were named in their places.

Senator Edge, of New Jersey, protested against the failure of the Secretary of the Treasury to recommend reappointment of Albert E. James, of New Jersey, who had a record of high efficiency in handling cases before the board. The Senator was informed that the reason for the failure of these men to secure reappointment was predicated on differences between them and the chairman of the board, over various administrative matters. On several occasions the opposition of Messrs. James and Graupner was so determined or so well founded as to swing a majority of the board away from the judgment of the chairman.

If the judgment of the chairman is to prevail at all times, why a board of sixteen members? All that is needed is an all-wise chairman to hear the taxpayer's plaint, a few file clerks, and possibly a stenographer. Because of a difference of opinions, tax cases are sent to the board for adjudication. Members of the board are presumably men of ability, many of whom no doubt are as well read on income-tax law and business matters as is their superior officer. Each member of the board has as much right to his opinion as the chairman has to his. The ends of justice are better served if the judgment of the majority should prevail in matters of opinion, rather than that the board should agree in toto with the chairman.

Without holding any brief for the men who were not renominated, the reason advanced by the Treasury Department is weak, to say the least. Here is another example of what happens when trained technical men in the government service refuse to be rubber stamps in the hands of an administrative official.

Mechanical Loading

THAT MECHANICAL LOADERS are steadily taking the place of hand loading in the coal industry is one of the impressions derived from a visit to the coal mining convention of the American Mining Congress at Cincinnati. This is part of the program of substituting machines for men which is helping to put the coal industry on the same advanced footing as other great national industries.

For the mining of metals and for earthy non-metallic mining industries the signs of the times are equally unmistakable. At the St. Joe lead mines, in southeastern Missouri, the largest lead mines in the world, something like 90 per cent of the loading (mucking) is done with electrically driven mechanical loaders. Many other underground metal mines have undergone or are undergoing similar metamorphosis. It does not take a great stretch of the imagination to foresee that machine loading will become as widespread and all but universal as machine drilling. Hand drilling still survives, but is becoming more and more rare; in a few years it is not improbable that hand loading will be the same unusual exception. Indeed, in the present age the grunting laborer using his puny "muck stick" (shovel) and his bare hands is already an anachronism. Mechanical loaders have not made as rapid progress in metal mines as in coal mines, because of the smaller room which in many drifts and stopes is available in metal mining. Two remedies will doubtless be worked out for this difficulty: first, the adaptation in size and mobility and flexibility of the mechanical loader, so that it will go into smaller and lower openings; and, second, an adaptation of stoping methods to make it convenient for loading machines to operate. There has been a corresponding evolution in the power drill within the last decade or two.

War Minerals Relief

WE COMMEND SECRETARY WORK for having taken a stand against further Congressional liberalization of the War Minerals Relief Act and further appropriations to that end. All operating losses of all those who produced tungsten, chrome, manganese, and pyrites during the war, including plant costs, having been paid, the further demand is being lobbied through Congress for payment to reimburse purchase price of the mining property. Against this Secretary Work very properly advises.

The producers of these war minerals have been dealt with very liberally by the government. Every miner who produced these war minerals at a loss has been compensated, thus making the war period the only epoch in history when 100 per cent of the mining broke even or better. Those who made profits out of war mining, strange to say, have kept them, and not returned them to the government. The reimbursements worked justice in many instances; in many cases they were unjustifiable, the mining operators having gone in for a profit and for no other reason. In some instances the theory of reimbursement was taken advantage of by unscrupulous people, and the costs of equipment ordered prior to the government need were collected from the Government Relief Fund. All in all it was an unpleasant episode, better terminated and

forgotten. The further greedy request that the government buy back the properties which were acquired under the lure of war prices for metals is ridiculous and unpractical. Should the government do this, would it take title to these mining properties, or would it reimburse the owner for the difference between what he paid and the present worth of the property? We hope that Congress will disregard the persistent feeders at the government trough and their allies in the House and the Senate, and wipe the dubious record off the slate. Among the principal beneficiaries of further gifts from the government would be the lawyers and speculators who have bought up what is left of many of the claims.

Stream Pollution by Mine Waters

NO GREAT COMPLAINT has hitherto been lodged against metal-mining companies because of the pollution of streams by mine waters. Such study as has been made of this matter has indicated that the coal industry is responsible for a large part of the pollution that exists. Various reasons may be given for the metal miner's escape from undue criticism in the past: first, the mines are frequently in comparatively isolated spots; second, often there are no streams to pollute; and third, the mine water in many cases is harmless. However, lead-mining companies in Idaho, it seems, have been ordered to purify the mine waters leaving their properties so that the streams will be as pure below the plants as they are above them. Furthermore, it is reported that action is being brought against a large zinc- and lead-mining and smelting company to compel it to decolorize the effluent water at one of its properties before discharging it, although it is said that the water has not been contaminated or injured for use. As a result of these events the American Mining Congress, at its recent convention at Cincinnati, appointed a committee of three to investigate the subject and recommend what action should be taken. The three were H. N. Eavenson, consulting engineer, of Pittsburgh; Howard I. Young, manager of mines for the American Zinc, Lead & Smelting Co., and J. J. Rutledge, chief mining engineer for the State of Maryland.

Study of stream pollution by acid mine drainage has already been made by the U. S. Bureau of Mines. Only last January the results were published by the Bureau as Report of Investigations No. 2725, written by R. D. Leitch. One of Mr. Leitch's conclusions is that the only way to avoid stream pollution by mine drainage wastes is to neutralize the acid in some way, possibly with the recovery of salable byproducts; also, that the question of waste disposal presents two alternatives to the companies interested: whether it is more economical to treat these wastes at their source, costly though the treatment be, or to bear with the damage done by them later, if untreated. The Mining Congress committee will doubtless find the Bureau's report of value in conducting its own investigation.

The danger, if there be any, to the mining industry in this matter of stream pollution is that the sporadic protests thus far made may develop into an epidemic, until each community will consider that it owes it to itself and its posterity to force those companies within its boundaries to take steps to render impossible the pollution of local waters. A public movement, once started, is difficult to stop. Mining companies will do well to avert legislation that may inconvenience them or even make it impossible for them to continue.

The Kentucky-Illinois Fluorspar Field

FLUORSPAR (fluorite) is a frequent and characteristic mineral of many ore deposits in the Cordilleran region of the United States, which deposits are of magmatic origin, and associated with igneous rocks and other magmatic phenomena. It occurs as a gangue intermixed with metallic sulphides, or, as a separate stage of the ore-injection, where this is differentiated into stages, as separate veins of fluorite, which tend to belong to the later (barren-gangue) stages of the general magmatic ore-injection period. The mineral has a very considerable economic value, being used as a flux in steel making; for the manufacture of artificial cryolite, which is used in the electrolytic bath in the manufacture of aluminum, and for other purposes. Cryolite is a fluoride of aluminum, and occurs in nature only in one locality, at Ivigtut, in Greenland. Fluorite is a fluoride of lime, and since its use in making artificial cryolite became possible, importations of natural cryolite into this country have virtually stopped.

The greatest commercial source of fluorite in America, and doubtless the greatest natural concentration, also, is in a limited district lying in northwestern Kentucky and southern Illinois. Here the fluorite occurs in great and persistent fissure veins, which have formed along many marked and extensive faults which also characterize the region. The fluorite is associated with a far larger bulk of calcite, which forms the mass of the fissure veins in question, and with a smaller and sporadic amount of lead and zinc sulphides, which, however, often occur in commercial quantities. The region is also characterized by a few peridotite dikes, which are closely associated with some of the veins that run higher in lead and zinc; and by complex and heavy faulting.

From this geologic association, most geologists who have studied this fluorspar region have decided that the veins have been filled by ascending solutions; and a number of them, such as Bain, Fohs and Currier, have concluded that they are of magmatic origin.

The occurrence of fluorite in this region is remarkable, in that the workable bodies have shown a distinct tendency, in every case where mining has long gone on, to diminish in depth, and in most cases eventually to practically disappear, within the limits of mining operations of only moderate depth. Although this habit might be suspected to indicate the concentrating effect of downward waters, such a conclusion is disbelieved by most of those who have given study to the question, because the relations of calcite and fluorite appear to be primary and undisturbed; and the calcite fissure veins continue to unknown depths with undiminished volume. In any case, however, this circumstance has an important bearing upon the fluorspar reserves of the district: on the other hand, the unprospected portion of the region is very considerable, and there is no doubt that as a whole it has a very considerable life. Its greatest commercial rival is the fluorspar region of England, where the mineral also occurs in fissure veins associated with calcite and with lead and zinc sulphides.

An Outlet for Copper in Agriculture

EXPERIMENTS conducted by W. W. Mackie, of the California Agricultural Experiment Station, have resulted so satisfactorily that a new outlet for several thousand tons of copper a year may result. Cereal smuts have for many years been a problem for the grain grower. The disease is caused by a fungus carried by the seed, so that treatment of the grain before planting is indicated. Soaking in formaldehyde has been found efficacious in some instances, but is destructive to the germs of cereal seeds sown in dry soil. Copper-sulphate solution was used many years ago, but this caustic chemical destroyed about half the germs of the treated grain as well as the smut fungus; this, however, could be obviated by a succeeding dip in lime solution. The double treatment is tedious and expensive, and sometimes the damp seed molds. A mixture of dry powdered copper sulphate and lime was an improvement, this suggesting the use of copper carbonate in the dry form, which is the procedure developed by Professor Mackie. The seed can be mixed with the copper carbonate as it is sown, and the only bad feature of the practice is the unpleasantness to the operator of the seeding machine, which can be obviated by wearing a respirator. The amount of carbonate required is comparatively small—something like 2 oz. per bushel of wheat; if all the wheat planted in the world were treated with this chemical, less than 2 per cent of the world's production of copper would be required, so that the anticipated wide use of this treatment process need occasion no fear of a copper shortage, and yet it is of importance as being one of the numerous small ways that copper is increasing its prestige as a most useful metal.

The effect on growing plants of the presence of metals in the soil is a kindred subject which is perhaps worthy of more investigation than agronomists have so far given to it. Sulphur, in its elemental form and as various compounds—copperas for instance—has been found to have a most stimulating effect under certain conditions, and tests have indicated that manganese and some other metallic substances may have possibilities for use in this connection. Those of our readers who are amateur gardeners and also have access to chemical laboratories have a chance to do some interesting and perhaps valuable research work in this field.

Mosul and Oil

THOSE of our correspondents and contributors who have believed that the Mosul question, in Asia Minor, had nothing to do with petroleum will be interested in the most recent dispatches from Europe, which state that peaceful negotiations between England and Turkey to settle their dispute are about to be consummated. The *New York Herald Tribune* prints a dispatch from London of May 31, beginning "The dispute between Great Britain and Turkey over the Mosul territory is on the verge of settlement, the *Herald Tribune* learned today from unofficial but well-informed quarters. Broadly speaking, it is believed the terms of settlement will comprise the acceptance by Turkey of 'the Brussels line' as to the Mosul frontier and compensation to Turkey in the form of a share in the proceeds from the exploitation of Mosul's mineral resources."

Vacations for Mining Men

VACATION TIME is here in most industrial establishments, but for many mining engineers in subordinate positions it is only summer. Just why it is that some mining engineers are not supposed to need vacations is difficult to say, for their duties are certainly arduous, both in the hours required and in the character of their work. It is really surprising to find, in traveling about the mining districts of the country, how many assistant managers, superintendents, and foremen are working approximately 365 days a year; last summer one assistant manager mentioned the fact that he had not had a vacation in eighteen years. This condition of affairs is possibly not true in the majority of camps, for the larger companies, operating in well-established mining districts, often have a fixed vacation schedule, with no Sunday work, but with the smaller companies, with limited technical staffs, it is quite common. Of course, there may be occasional days off, but no opportunity to get far from the camp.

Conditions are not the same as they were in the olden days, when the engineer in an out-of-the-way mining camp really had little to occupy his spare time, and might as well be on the job as at home doing nothing, or worse. The automobile is now a common possession, providing easy means of taking week-end excursions to neighboring points of interest and of carrying the family to the more distant city or seashore for a longer period. Such a change of scene will help to remove the cobwebs from a brain that is forced to do the same work and meet the same conditions for from eight to ten hours every week day and usually at least half that on Sunday.

The employer can well get more and better work from a man in 300 or 325 days of a year than in 365. With an exceedingly limited staff, it may seem hard to let a man go for a few weeks, but if the organization is as it should be, a capable substitute can be found who will work hard to fulfill his responsibilities and possibly make some improvements that the regular incumbent had overlooked. Usually it is thought that the services of one particular man are essential in the hiring of manual workers, in OK'ing payrolls, in ordering supplies, and similar executive duties, but there is something wrong if such duties cannot be acceptably done for a limited time by someone else. In fact, it is well to have a man trained for such duties in case of sickness or other enforced absence.

If a mining engineer is commonly on the job Sundays, even for only two or three hours, a month's vacation would certainly seem none too much. If he has his Sundays and possibly his Saturday afternoons off, as is none too common, two weeks' vacation from the confinements of a mining camp would seem to be a minimum.

Modern progress has been particularly active in the realm of providing interesting things to do in one's spare time, so it is only by having some of this spare time that one can take advantage of much that civilization now offers. Possibly the mining engineer on the lower rungs of the ladder cannot expect just yet to be as liberally treated as the city carpenter or bricklayer, who would not think of working more than five eight-hour days a week, but he, with his family, is certainly entitled to rather more consideration than he sometimes gets.

Mining Men of Note

Colonel Carmi A. Thompson

IN THE APPOINTMENT of Colonel Carmi A. Thompson as head of a commission to investigate the Philippine Islands and other Pacific possessions of the United States, the President has made a wise choice. One of the points stressed in the President's letter announcing the appointment of Colonel Thompson as a special commissioner to make a thorough survey of the economic and industrial conditions in the Philippines was the natural resources of the Islands. The President stated that "the result of an intensive study of the possibilities of these insular possessions may be to increase the development of their natural resources, and such a study will be of great benefit and importance not only to the United States but to the Philippines as well." It is his desire to have information gathered by a man in whom he has confidence and whose practical experience in business, law, and finance will enable him to give a comprehensive and accurate report. Colonel Thompson was born in Wayne County, W. Va., Sept. 6, 1870. He is the son of a coal miner, and began his life in the mines of southern Ohio, working as his father's helper after school and during vacation. He walked six miles to and from school each day. He was graduated from high school, taught school, entered college, and while there it was necessary for him to do odd jobs to meet his expenses. This self-made man was graduated from the Ohio State University as a lawyer. Soon after graduating he entered the army as a private during the Spanish-American War, and when that war was over he returned as a major. He became City Solicitor of Ironton, Ohio, and was elected State Representative from Lawrence County, Ohio, in 1905, being made Speaker of the House of Representatives during his second term. In 1906 he was elected Secretary of State for the State of Ohio, and in 1911 was Assistant Secretary of the Interior. In 1912 he was secretary to President William H. Taft and for six months in 1913 was Treasurer of the United States. Colonel Thompson then became interested in the iron-mining industry of Minnesota, in which he has been an active operator for the last twelve years, as a member of the Tod-Stambaugh Co., Cleveland, Ohio, of which firm he is now president. He is also president of the Becker Steamship Co. and a member of the law firm of Thompson & Smith. He served as a member of the Advisory Commission, World Conference on the Limitation of Armaments, having been chairman of the subcommittee on new methods and new weapons of warfare. He introduced a resolution, which was unanimously adopted by the Conference, prohibiting the use of poison gas in future warfare. He is now Commander-in-Chief of the United Spanish War Veterans. Though Colonel Thompson is a lawyer by profession, he has spent nearly all his life in the atmosphere of the mining industry—coal, iron, and copper. In accepting his appointment he says, "We all feel that there are vast possibilities of developing the natural resources of the Philippines and we know this field has scarcely been touched. I believe that a thorough understanding of the conditions and possibilities, if I am able to properly analyze them, may mean a great deal to commercial and industrial interests both in the Philippines and in the United States and throughout the world." Colonel Thompson's broad experience in mining, law, finance, business, and politics fits him admirably for the job ahead of him.

COLONEL CARMI A. THOMPSON

President Coolidge has instructed Colonel Thompson to complete his investigations not later than November, so that the President may have his report at hand prior to the assembling of Congress in December. After conferring with the President, Colonel Thompson said that, though his mission was not intended to have any political ramifications, it would be natural for him to report to the President concerning local politics in the Philippines, and he expected to touch on the matter of self-government for the Islands. The President also wishes to get detailed reports on sanitation and health conditions, as well as the financial situation. He stressed that the survey was intended by the President to obtain enlightenment for himself and Congress with a view to assisting in the development of the Philippines. He sails from Seattle, June 15.

Monterey: Smelting and Industrial Center of Mexico

Excellent Location Offsets Depletion of Near-by Mines—Advantages of Refining Lead in Mexico—Latin America's Largest Steel Plant

By Arthur Barrette Parsons
Assistant Editor

The Obispado, an historic landmark on the mountain near Monterey

A TRAVELER wishing to see Mexico at its best probably can do no better than to visit Monterey. Mexico City, of course, is twice as large; it is more metropolitan, more cosmopolitan; it is the financial and commercial as well as the political capital of the republic, and wears its distinction with a certain grace. Monterey gives the impression of substantial prosperity. It is a clean place, lacking the squalor of some other Mexican cities; it has electric light and water systems, a street railway, many paved streets and good public buildings; but at the same time the atmosphere is distinctly Mexican. Its prosperity is based on a wide variety of industrial activities. Besides two lead smelters and the only iron-blast furnace and steel plant in North America outside of the United States, the following large enterprises are conducted at Monterey: the largest brewery in America; a modern portland-cement plant; cotton mills, glass works, chemical plants, shoe factories, a nail plant, and factories of half a dozen other kinds. Although most of the larger companies are financed and managed by foreigners, many positions of some responsibility are held by Mexicans. At the plant of the American Smelting & Refining Co., for instance, only twelve Americans are employed. Good-sized payrolls in productive industries make for general prosperity, and this is reflected in general conditions in the city, which, by the way, claims a population of almost 100,000.

Golf Thrives in Monterey

A handsome Casino, the Foreign Club, a club sponsored by the German element, and a golf club with a first-rate course, has Monterey. By coincidence, a golf professional arrived at Monterey one evening early last November on the same train that carried me thither. Preceding this gentleman off the train, I was accosted by the committee, who had never seen him, as the prospective golf teacher, a mistake that I deemed a compliment. Most of the smelter folks are devotees of the game.

Facing on the Plaza Hidalgo is the Ancira Hotel, an imposing structure, that unfortunately is only partly complete as to its interior. If and when funds are available for finishing it, the huge patio will be a handsome place. When I asked for a room with a bath, the clerk handed me a big brass key and I inquired the price. He told me 8 pesos. I inquired casually if he hadn't another room at 6 pesos; whereupon, without hesitation, he replied "You can have that one for six." If the rates were based on the cubic contents of the rooms they would be cheap indeed. The ceiling is at least twice as high and the other dimensions are nearly double those of the average room in a modern New York hotel, which would make the volume about eight times as great. Among the agreeable and hospitable permanent residents at the hotel are Frank J. Hobson, of the Peñoles company, and Mrs. Hobson. Many of the Americans live in a new colony out in the direction of the golf club, where possibly thirty houses surrounded with lawns and gardens, quite like California homes, give a very different atmosphere from the usual residences of European style with barred windows along the sidewalk and an unseen patio within the inclosing walls. This, of course, is typical of all the Mexican cities.

Proximity to Coal Fields Important

Monterey owes its continued importance as a smelting center in large measure to its excellent location and railroad connection, for the mines directly tributary to it are not as productive as they once were. It is close to the Sabinas coal fields of Coahuila, from which coke is obtained; and is on the main line from Torreon and Chihuahua to Tampico, the port through which much of the lead produced in the republic passes for export. Most of the mines shipping ore directly to Monterey are comparatively small, but there are a large number of them, and it is possible that bigger tonnages may be developed. At the time of my visit neither of the smelters, one owned by the American Smelting & Refining Co. and the other by the Cia. Minera de Peñoles, a subsidiary of the American Metal Co., was operating at a maximum capacity. Each was receiving 1,200 to 1,500 tons of ore, concentrate, and "foreign" byproducts per month. The A. S. & R. plant, being the larger, had more inactive capacity.

The largest shippers to the A. S. & R. smelter are the Towne Mines of the Mexican Lead Co., situated near Monterey, and being operated under a long term contract by the smelting company, and the Charcas Unit of the Asarco company, which ships lead concentrate from its new selective flotation plant at the Tiro General mine. Flue dust and other byproducts from the company's new copper smelter at San Luis Potosi are an important part of the intake and in addition about 100 smaller shippers send ore more or less regularly.

S. H. Levison, superintendent, showed me around his plant, which is one of the cleanest and most orderly smelters I have ever seen. The only new installation is

a baghouse for fume from the Dwight-Lloyd sintering machines. This has 528 bags, half of which are wool and half mohair, equipped with automatic shakers. The temperature is kept between 70 and 90 deg. An oil burner in the flue heats the gas to a point above the minimum, to avoid deterioration of the bags that would result from condensed moisture in conjunction with the acid fumes. An alarm, operated automatically by a pyrometer, gives warning if the temperature exceeds 90 deg., whereupon the burners are shut off. The high zinc content of the charge has made necessary a double roast in the D.-L. machines. The pre-roast reduces the sulphur to 9 per cent and the final roast to 4 per cent. Tampico crude oil is the fuel. The same fuel is used in the steam-electric power plant and in the locomotives.

Large Repair Shops at Smelter

Operated in conjunction with the smelter is one of the largest groups of mechanical shops in Mexico, including foundry, boiler, machine, carpenter, and blacksmith departments. About forty main-line locomotives are kept in repair here, and a large volume of heavy repair work as well as building of new equipment for the other A. S. & R. smelters and concentrators is done at Monterey. The foundry is prepared to cast almost anything. Electric-arc welding is a specialty, and thousands of dollars have been saved by reclaiming equipment that formerly was discarded as being useless.

Mr. Hobson took me out to the Peñoles smelter, where I met U. H. Berthier, the superintendent. The feature here is the lead-silver refinery, the only one in Mexico, and the electrolytic silver-gold parting plant. Here the Moebius process with a continuous moving cathode is employed. Mr. Berthier has promised to write a complete technical description of his work in the refineries for the *Engineering and Mining Journal*, but a few notes here will not interfere with the values of his article.

The economic situation is particularly interesting, so interesting, in fact, that the A. S. & R. Co. has long debated the advisability of erecting a plant for the same purpose, and may yet decide to do so. Although the Peñoles people did not mention it, lead bullion and even concentrates from A. S. & R. plants find their way to the Peñoles smelter at Monterey.

In the first place, the Mexican tax on mine products is graduated according to the condition in which the metals are exported. The purpose, of course, is to encourage the erection of refineries in Mexico. The accompanying table indicates how the tax is scaled down. Manifestly then it is advantageous to separate the gold, silver, and lead before exporting.

Schedule of Production Taxes on Metals, December, 1925

Showing per Cent of Value Levied

Metal	Gold	Silver	Lead	Copper	Zinc
Current value per kilogram, pesos....	1,329.19	45.60	0.44	0.66	0.47
Condition when exported:					
Crude ore	8.5	7.0	2.0	0.25	1.0
Concentrate	8.0	6.5	1.8	0.20	0.9
Precipitate	7.25	5.75	....	....	....
Impure bullion or matte	7.25	5.75	1.5	0.15	0.8
Refined bullion	7.0	5.50	1.0	0.10	0.7

Map of Mexico

Showing the states, railroads and principal mining districts. Note the Situation of Monterey with respect to transportation from Sabinas, the other smelting centers, Tampico, and the United States

The Monterey Casino, the Cathedral, Saddle Mountain in the background and the Plaza in the foreground

Still another advantage of producing refined lead in Mexico is this: Under normal conditions a good proportion of Mexican lead ultimately is sold in the European market, because the United States does not absorb all of it, in addition to domestic production. The only alternative to refining in Mexico is to ship the bullion to one of the plants on the Eastern seaboard in the United States, where it is refined in bond and then exported to Europe. The cost of shipping from Tampico to the United States and thence to Europe is about $4 per ton more than the rate from Tampico to Europe. Moreover, the gold contained in exported lead bullion must be reimported to Mexico to comply with the law, and this entails some expense.

Against these may be placed some disadvantages. Fine silver produced in Mexico must be sent by express to New York, a costly procedure compared with shipment as ordinary cargo as a constituent of lead bullion; shipping facilities from Tampico to Europe are not as regular or satisfactory as to the United States; and the operating cost of refining in Mexico probably is higher than in the United States. However, there is no doubt that a net saving of several dollars per ton of lead is effected by the operation of the refinery at Monterey.

Produce 2,000,000 Oz. Silver Monthly

In addition to lead bullion from five smelting plants, cyanide precipitate and doré bullion from about fifty producers in a dozen states in Mexico are received.

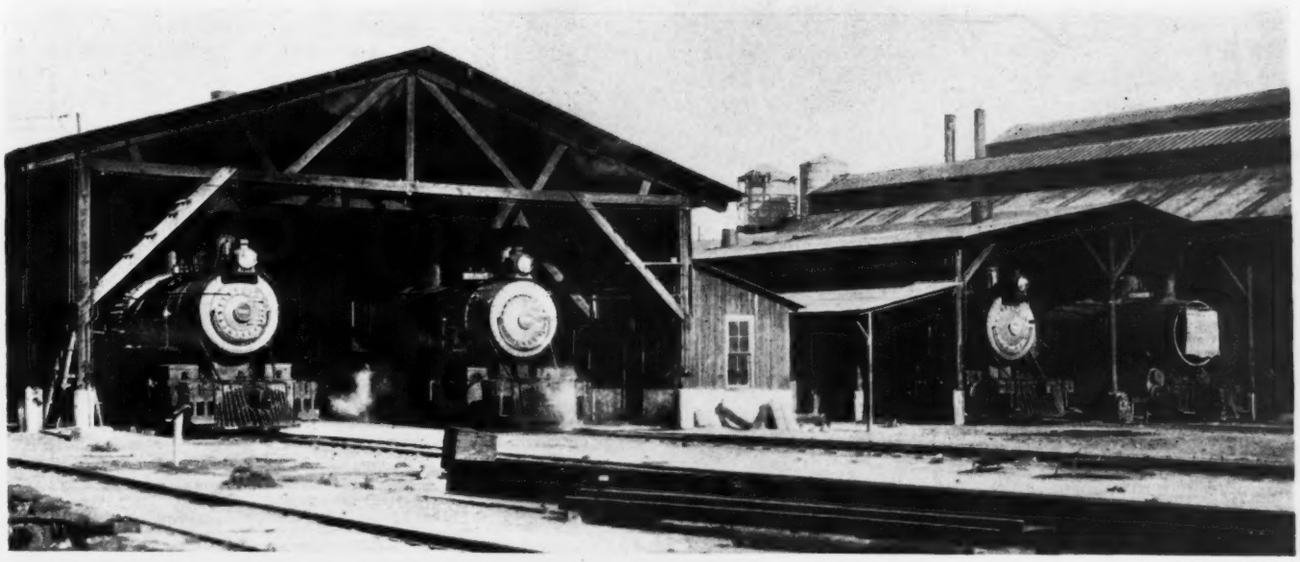
This material for the most part is treated on a toll basis, the shipper being returned the refined metal for marketing on his own account. At the time of my visit the refinery was handling about 9,000 tons of bullion per month, and was producing about 2,000,000 oz. of silver, of which half was toll metal and the remainder Peñoles production. The refined lead is of corroding grade containing a minimum of 99.96 per cent lead and not to exceed 0.03 bismuth. One product of the plant is litharge, made by oxidizing refined lead, for marketing in Mexico. This is sold for use in the ceramic industry, in oil refineries at Tampico, and in cyanide plants at various points in the republic.

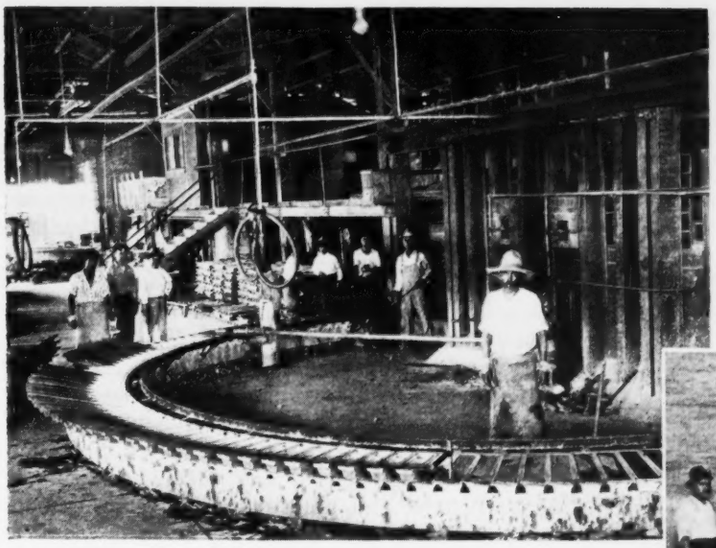
The basis of the operation is the familiar Parkes process; but the arrangement of the equipment and many details of operation are unusual. Work is now under way to substitute the Harris process for the procedure shown in the accompanying flow sheet for dezincing the lead after the removal of the silver. "Foreign" cyanide precipitate, after being sampled, is added with the zinc-retort bullion and litharge from the cupels and melted in a special "sulphide" furnace, the slag from which goes back to the blast furnace. Foreign cyanide bullion joins the rich lead from the "sulphide" furnace together with a quantity of return silver from the gold-silver parting plant as feed for the cupels.

One feature of the blast-furnace operations is the use of a conveyor system for feeding. The furnaces have been remodeled with tops of the Australian type, and a specially designed distributor permits the feeding of material at any point on the charge that requires it. The same distributor serves each of the furnaces, and is fed by a system of conveying belts from the charge-mixing floor below. This novel procedure, I believe, originated with and is strongly advocated by George H. Harbordt, general manager for the Peñoles company in Mexico, who was away from Monterey at the time of my visit. The charge is rich in lead, averaging about 25 per cent. A typical slag analysis is as follows:

Constituent	Per Cent	Constituent	Per Cent
Silica	31.0	Zinc	5.0
Iron	20.5	Aluminum	2.5
Lime	21.0	Lead	1.0

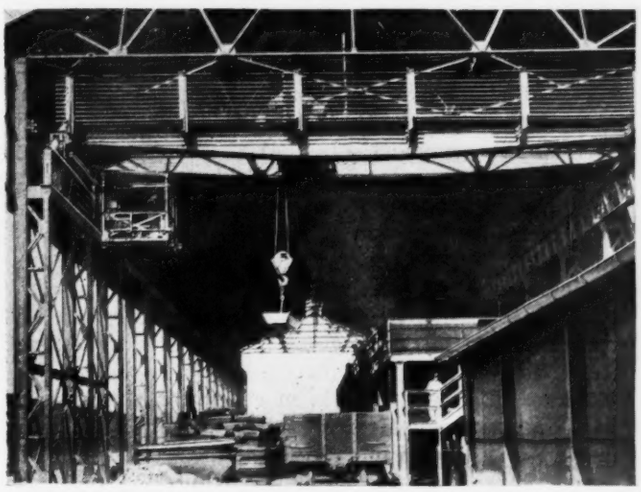
Considerable equipment has been added in the power plant looking to increased economy. Included in this are a 500-kw. Curtis-General Electric turbo-generator; a Nordberg uniflow-engine generator; another Nordberg uniflow engine to drive a Roots blower; and a set of Aero coal pulverizer-blower units for firing the boilers. These machines are unusual in that the coal is pulverized and fed as needed, no storage of fine coal

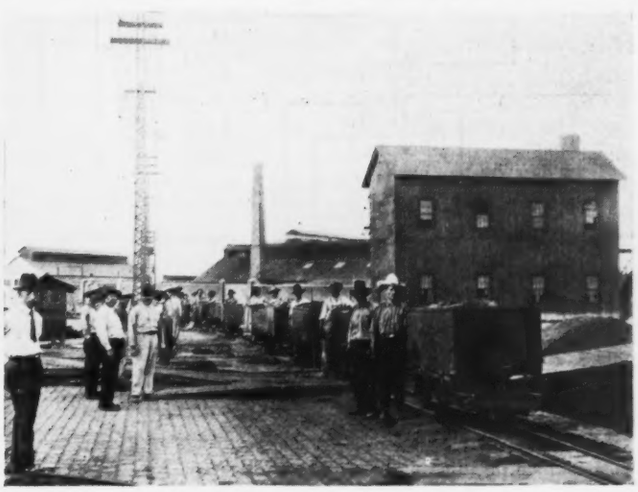




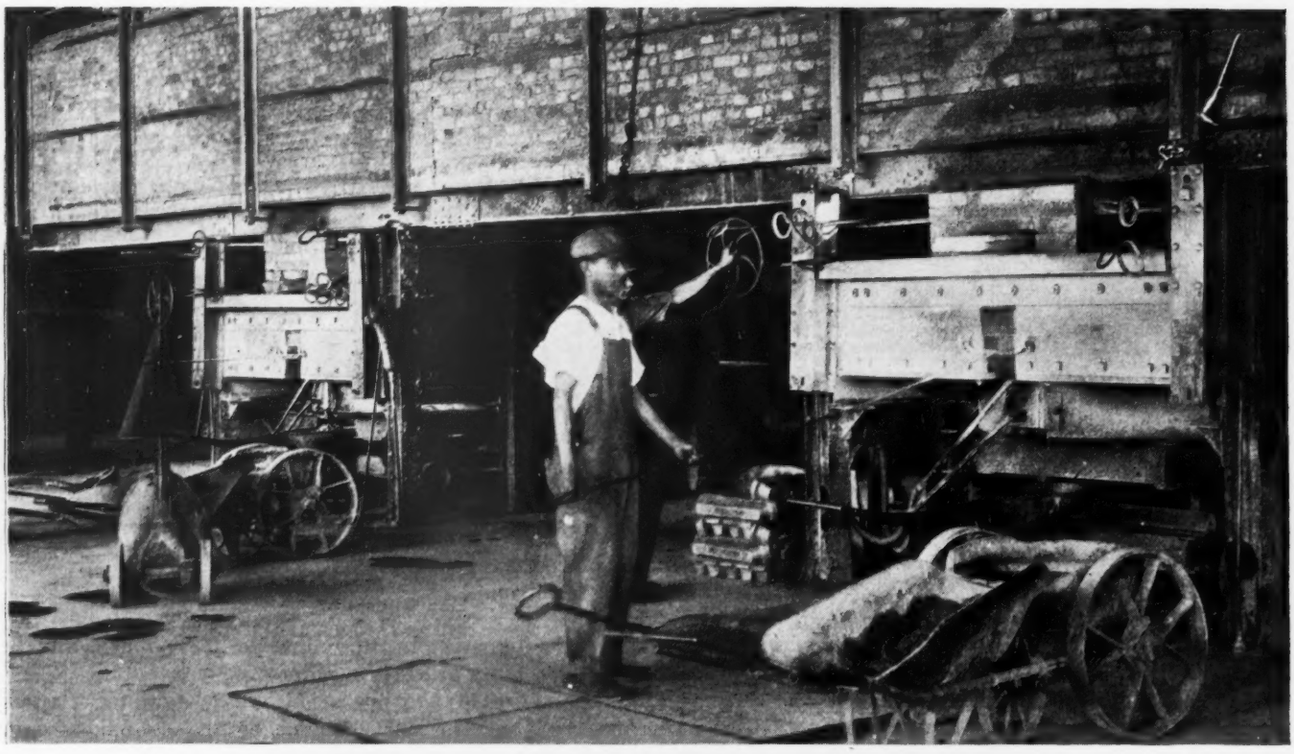
Above—Roundhouse where the Peñoles company keeps its locomotives for main-line as well as intra-plant work. Left—Casting lead bullion. This is refined metal ready for shipment to the United States or Europe, via Tampico

Right—Sampling "cyanide" precipitate handled on a toll or custom basis for many silver and gold producers. Below—Unloading cakes of "foreign" lead bullion for refining. Below, right—Tramming ore for charging the blast furnaces at the smelter

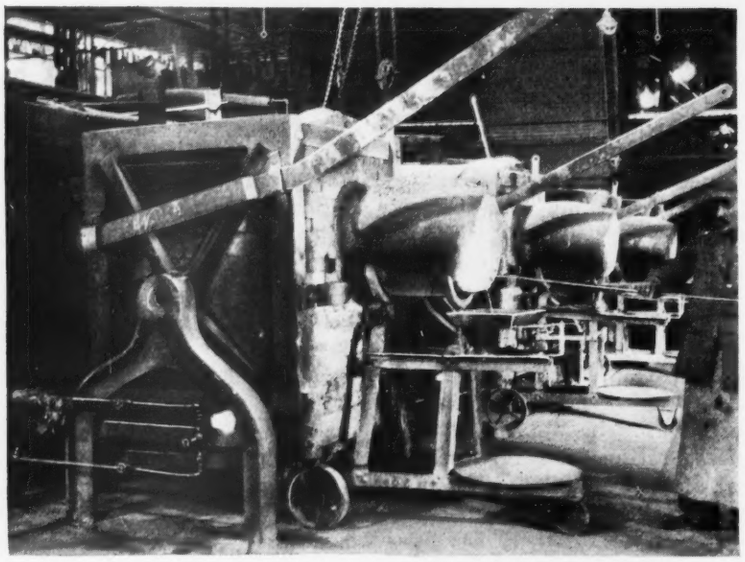




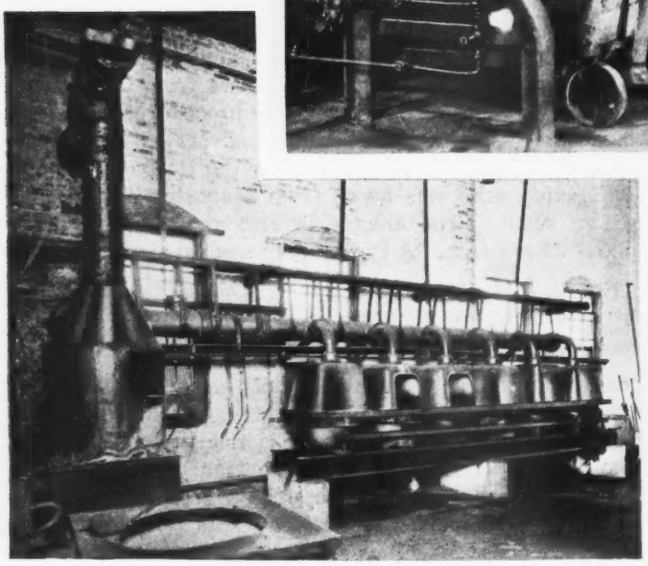
Smelter and Refinery of the Cia. Minera de Peñoles at Monterey

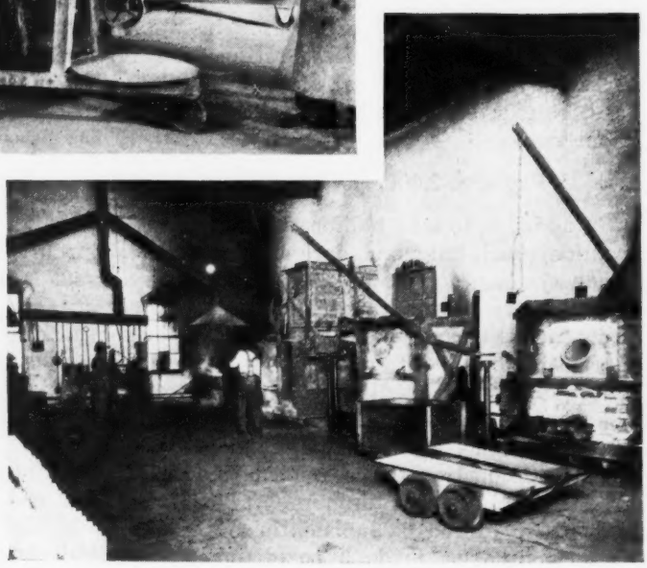


Above — Cupeling the silver from "sulphide-furnace" lead (see flow sheet). Below — Parting plant where silver is dissolved, leaving the gold as a sludge to be melted and cast for shipment to Mexico City



Left—Retorts in which the zinc is removed from the zinc - silver crust from the desilverizing kettles. Below—Silver - furnace room. At the left are bars of fine silver ready for export to the United States





With him I made a call on Don Vincente Ferrara, one of Monterey's most prominent and respected citizens, builder of the Peñoles smelter and founder of the steel works. From him—L. Procissi, his engineer, acting as interpreter—I learned that he was born in Italy seventy years ago. Four of his uncles emigrated to New Orleans, but an epidemic of yellow fever in 1857 induced them to go to Monterey. Don Vincente (as he is known by nearly every one of consequence in Northern Mexico) joined them there when he was fourteen years old and Monterey was a city of only 25,000. Mining was dull at the time, but in 1880 he became interested in some mines at Sierra Mojada, where he built a small smelter. Ten years later he financed the building of the first smelter of any size in Monterey. Newton R. Wilson, A. K. Brewer, and Carlos Chase, names well known in smelting history, were employed by him, and later Mr. Harbordt, who as manager for the Peñoles company still supervises the operation of the plant.

A Successful Organizer

In 1899 he was the dominant figure in the organization of the Compañia Fundidora Fierro y Acero de Monterey, of which he was president until 1913. Subsequently he disposed of his holdings in the company, and in 1920 he sold the smelter to the Peñoles company. Today he owns a dozen small producing mines, and incidentally several ranches in Nuevo Leon and Coahuila, where he raises livestock, corn, wheat, tobacco, and grapes on a large scale. He has five daughters and six sons. All of the latter were educated in the United States, but are now in business in Monterey.

Don Vincente is a big man, modest and unassuming. He started without capital, but he saw opportunity for the exploitation of natural resources where others failed to see it. He did much for Monterey; and he did well for himself. But I believe he actually blushed when his interpreter told him that I wanted to say something about his career in the *Engineering and Mining Journal.*

It happened that the evening I left Monterey for Charcas, Mr. Tower took the same train for Saltillo. We drove to the station together, but as he wanted to send some telegrams I arranged for the services of a *cargador*—otherwise a "red cap"—and took Mr. Tower's baggage and mine through the gate to the waiting train. He had assured me that we could buy pullman tickets on board. However, the Mexican pullman conductor, who could talk fair English, was of different mind, and would not let me on the train. I was perfectly willing to go back and buy a ticket, but I asked him if the *cargador* could deposit the luggage in the car. Even to this request he turned a deaf ear. My bags were of little value, but I did not know what Mr. Tower might be carrying in his, so I kept my eye on them and awaited his return. When he arrived I explained the situation with the conductor listening in. Without a moment's hesitation or a word of protest, Mr. Tower took my arm and started back for the gate, telling the conductor we would buy the tickets as he directed. We had not gone ten yards, however, before our *cargador* overtook us with the information that the conductor had reversed his own verdict and would not only let our baggage aboard but would sell us our pullman ticket on the train! This little episode illustrates a trait of the Mexican character that needs no comment. It also shows why George W. Tower, like numerous other American mining engineers, gets along so much better than others in the land of the cactus and the tortilla.

Copper, Lead, and Zinc Production Increased in British Columbia in 1925

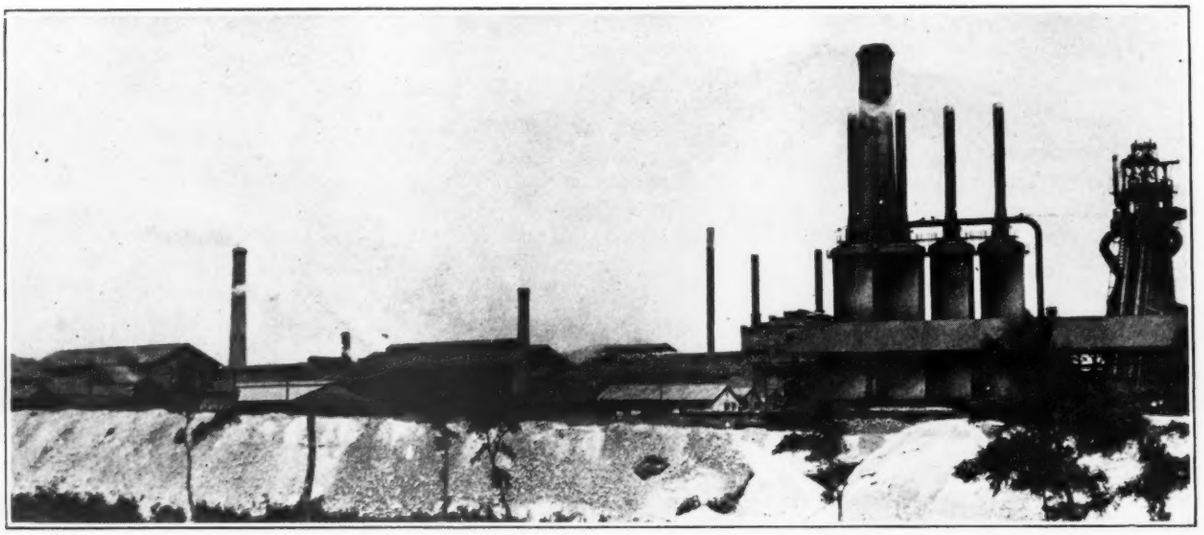
The annual report of the British Columbia Minister of Mines, which has just been published, gives the following revised figures for the mineral production of British Columbia for 1925; the production for 1924 is also given for the purpose of comparison.

	1925		1924	
	Quantity	Value	Quantity	Value
Gold, placer, oz	16,476	$280,092	21,037	$420,750
Gold, lode, oz	209,719	4,335,269	247,716	5,120,535
Silver, oz	7,654,844	5,286,818	8,341,768	5,292,184
Copper, lb	72,316,432	10,153,269	64,845,393	8,442,870
Lead, lb	237,899,199	18,670,329	170,384,481	12,415,917
Zinc, lb	98,257,099	7,754,450	79,130,970	4,266,741
Coal, long tons	2,328,522	11,643,610	1,939,526	9,697,630
Coke, long tons	75,185	526,295	30,615	214,305
Miscellaneous value	.....	2,843,110	.....	2,833,672
Total	.....	61,492,242	.....	48,704,604

It will be seen that, compared with the previous year, the value of the production has increased 25½ per cent. Though this is due chiefly to the greater production of all base metals, it is attributable in part to the increase in the value of these metals. Then, too, the values given for several metals in the 1924 report are not comparable with those of previous years, because several changes in the method of valuation were made in that report. Placer gold, which in previous years was valued at $20 per ounce, was valued at $17 in 1924; lode gold was valued at $20.67, instead of $20. Lead and zinc, which in previous reports have been valued on the New York quotations, were valued on the London quotations. As nearly the whole of the lead and zinc outputs are sold on London prices, this palpably is a wise change.

A noteworthy feature of the production is that more than 90 per cent of its value has come from five districts and from a comparatively small area. This shows how little the province has been systematically explored. The Fort Steele division, containing the Sullivan mine and the Crow's Nest Pass coal fields, provided $31,510,755, or more than half of the value of the whole production; southern Vancouver Island, chiefly from its coal fields and its cement plants, contributed $8,832,823; Nass River division, which contains the Granby Consolidated Mining, Smelting & Power Co.'s Hidden Creek mine, provided $5,977,875; the Vancouver and New Westminster district, in which the Britannia mine is situated, contributed $4,842,922; and the home of the Premier mine, the Portland Canal division, contributed $4,170,310.

The decline in gold and silver output is due mainly to the cessation of production from the Consolidated company's Rossland mines during most of the year and to the lower tenor in the grade of the ore in the deep levels in the Premier mine. At present the Consolidated company is smelting considerable siliceous ore from its Rossland mines, as it needs the silica to flux the concentrate received from the Allenby Copper Corporation. This will probably increase the gold output in 1926.



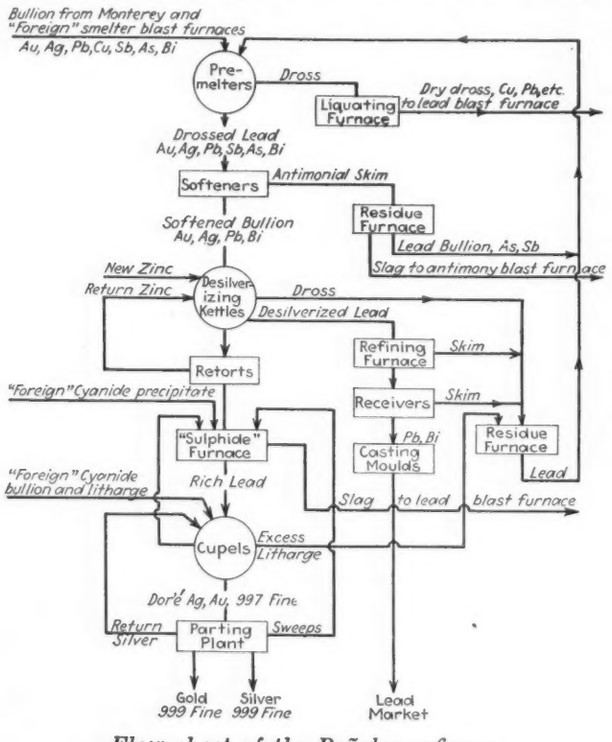
Monterey Steel Works

The only iron-ore blast furnace between Birmingham and Brazil forms one department of this plant.

dust being required. Each unit is self-contained mounted on trucks which can be moved from one boiler to another as needed. There is no danger of dust explosions, and the machines are said to be foolproof, a consideration not to be ignored when dealing with unskilled labor.

The Steel Plant

To H. Himes, treasurer of the Peñoles company, I am indebted for an interesting visit at the plant of the Cia. Fundidora de Fierro y Acero de Monterey, or more briefly the Monterey Steel Works. This is the biggest enterprise in Monterey, and has, as I said before, the only iron-ore blast furnaces between Birmingham, Ala., and Brazil. According to M. Ulmer, the director general, 2,500 men are employed; 250 to 300 tons of pig iron is produced daily; and from 80,000 to 100,000 tons of finished steel products are turned out each year. Rails and railroad iron and any kind of structural shapes are the principal products. Steel castings and manganese-steel castings are also made, many of the mining companies, so I discovered later, buying manganese steel from the Monterey plant. The equipment includes one blast furnace, for making pig, and five open-hearth furnaces, one Bessemer furnace and one electric steel furnace, in addition to the rolling mills and a half dozen fabricating departments.



Flow sheet of the Peñoles refinery

Lead bullion, cyanide bullion, and "cyanide" precipitates from all parts of Mexico are refined here

Iron ore, grading 67 per cent, is obtained from the Iron Mountain mine in Durango and a less rich ore, averaging 62.5 per cent, from the Golondrina mine, situated in Nuevo Leon between Monterey and Loredo. Coke comes from the ovens of the Peñoles company in the Sabinas district and limestone from quarries near Monterey.

Mr. Ulmer was particularly proud of his welfare work. He has day and night schools for the Mexican workmen themselves, and others for their children. There is a club for workmen; and a plant colony of more than 400 families, who operate a large community farm.

Attention to Industrial Relations

One of his ideas is that athletics, particularly competitive athletics, gives the workers a healthy outlook on life. He has a remarkably well-laid-out and well-cared-for athletic field, with a 400-m. running track and a baseball diamond. Various departments have their baseball teams, and the best players form a team to represent the company. Industrial workers from anywhere can arrange to use this field on one condition: that no admission whatever is charged. Last fall a track meet was held in which 200 men participated, some of them coming many hundred miles for the competition. Mr. Ulmer, I believe, is Spanish—certainly not American or British—but he speaks English and showed me files of the *Engineering and Mining Journal* in his office.

George W. Tower, who is in charge of Guggenheim Bros.' operations in Mexico, and to whom I am greatly indebted for his help in making the most of my time in Mexico, happened into Monterey while I was there.

Engineering Principles Applied to Exploitation of a Clay Deposit

Careful Development of Ore by Drilling—Layout of Tracts and Waste Dump—Storage Plant with Conveyors and Mechanical Reclaiming System —Clay Dried by Natural Ventilation

By C. N. Schuette
Mining Engineer, San Francisco, Calif.

C. N. Schuette

THE Clay Corporation of California, a subsidiary of the Stockton Fire Brick Co., was formed to exploit a deposit of fireclay near Lincoln, Placer County, Calif. Expansion of the firebrick plant at Stockton made it necessary either to increase the clay storage facilities at that plant or to provide for clay storage at Lincoln. Storage of clay is necessary not only to have a reserve but also because clay pits cannot be operated to advantage in the rainy season. It is necessary to mine enough clay in the dry months to carry through the wet season. The clay is shipped in gondola cars in dry weather while dry; and stored clay is shipped in box cars in wet weather. A plant for both storage and grinding was erected at Lincoln.

The plant after full development was to have a capacity of 50,000 tons of crushed and dried clay per annum; and provision was to be made for the handling of other clays which it might be desired to ship to and store at Lincoln. Efficiency of operation and a minimum crew were two objects to be attained for the proposed plant.

The property is situated about two miles northwest of Lincoln. The state highway and the Southern Pacific Railroad run along the southerly boundary of the property as shown in Fig. 1. Just east of the offset southern part of the property is the clay pit of the Lincoln Clay Products Co.

From the highway toward the north the ground rises with a gentle slope to form a hill some 45 ft. higher than the level at the highway. The crest of the hill is 1,200 ft. north of the highway and roughly parallel to it. From the crest of the hill toward the north the ground drops off sharply to form a flat which continues to the northern property line.

Deposit Underlies Andesite Caprock

From the southern boundary of the property to a line roughly parallel to and approximately 1,600 ft. north of the highway, the area is covered with a lava flow. This rock, an andesite-agglomerate, influenced the topography, as it protected the softer underlying strata from erosion, and so formed the hill.

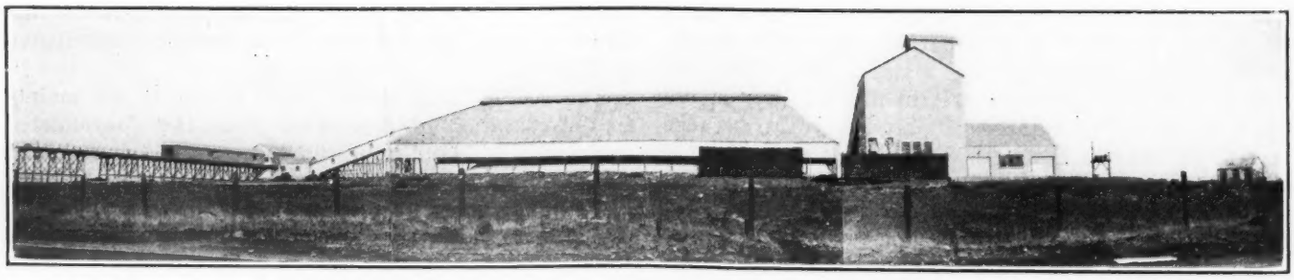
A number of clay beds underly this caprock and are exposed in the neighboring pit. The beds lie practically flat and the individual beds show little variation in thickness. The particular clay sought by the Clay Corporation lies approximately between elevations 129 and 146, and is therefore about 17 ft. thick. An old test pit on the north slope of the hill yielded the same clay at about the same elevation.

A topographic survey and geological reconnaisance of the ground was made in February, 1925, to obtain data for locating the pit and plant. It was certain that the clay beds exposed in the neighboring property are found at practically the same elevations, on that part of the Clay Corporation property that is overlain by the lava capping. In considering possible sites for the plant and pit, the hill was the determining factor.

Importance of Waste Disposal

It was decided to develop the pit on the north slope of the hill. This location of the pit has the advantage that the waste dump can be close to the pit and on land not underlain by clay. The overburden at all points is as thick as or thicker than the clay under it and represents the greater tonnage of material to be handled. The greater tonnage, then, has the shorter haul.

On this northern slope, also, the overburden on the site of the initial cut is less by 15 ft. than if the pit were started behind the plant on the south slope, and little or no capping need be blasted in the early development of the pit.



Loading trestle Crushing building Storage building Mill Office

General view of finished plant of the Clay Corporation of California

The site chosen lends itself to a pit development parallel to the trend of the hill, which will give a long pit face. The pit when fully developed will easily yield a full season's tonnage at one cut. This in turn means that all necessary trackage can be laid before mining begins, which will avoid the delay, expense, and annoyance of continual track work, and so allows the use of heavier rail and cars.

It was decided to place the plant on the gentle southern slope close to the railroad. The spur track, as laid out, gives the maximum "spotting" length with minimum grading, and there is ample room on both sides of it for proposed future additions to the plant.

In the location of both the spur track and the industrial railroad tracks, cuts were almost entirely avoided, as cuts in the hard caprock would have added materially to the cost.

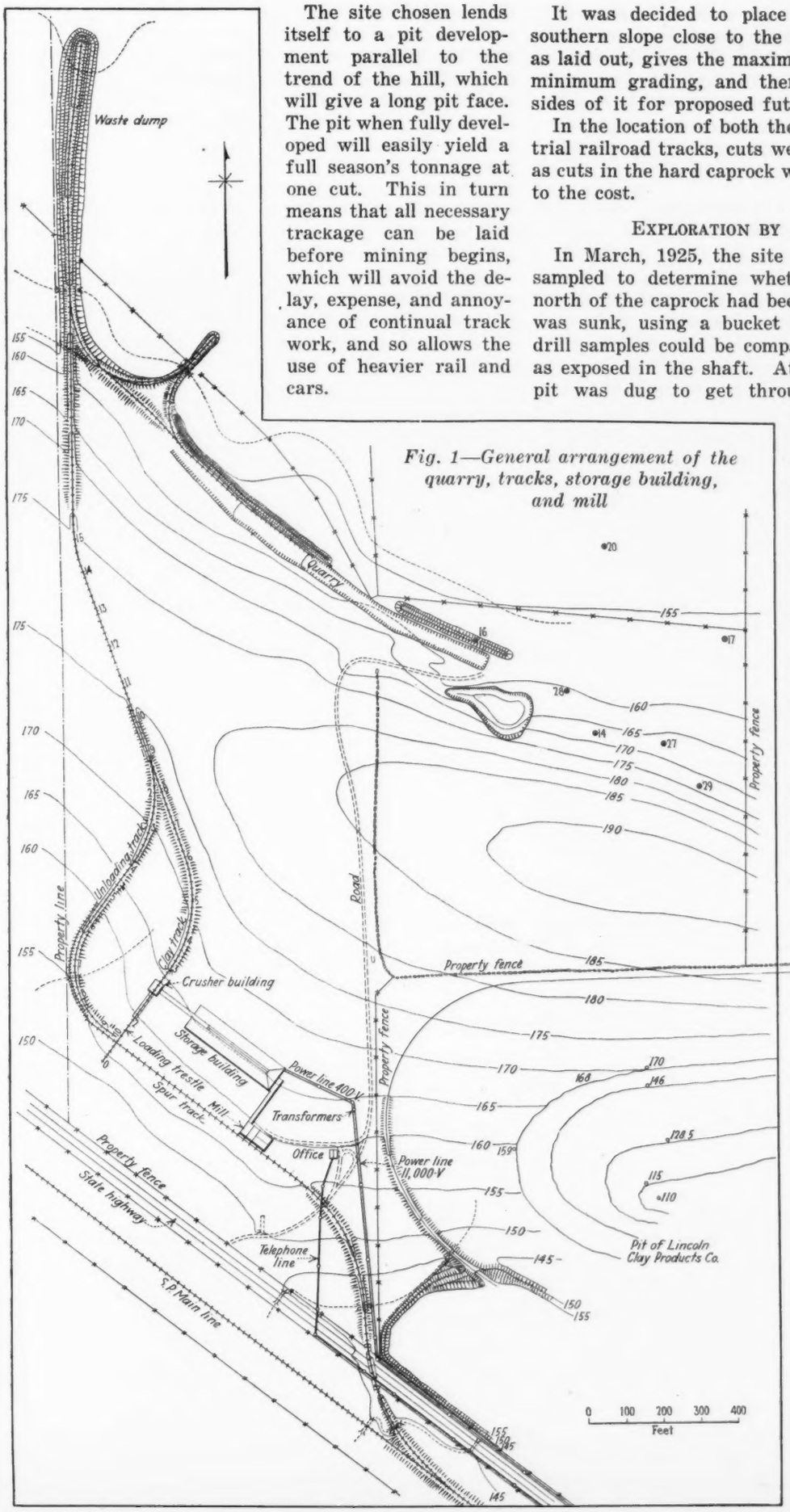


Fig. 1—General arrangement of the quarry, tracks, storage building, and mill

Exploration by Auger Drilling

In March, 1925, the site of the pit was drilled and sampled to determine whether or not the clay beds north of the caprock had been eroded. One small shaft was sunk, using a bucket and windlass, so that the drill samples could be compared visually with the clay as exposed in the shaft. At the sample points a small pit was dug to get through the surface layer of boulders and gravel.

Auger bits having a diameter of 1½ in. and a flute nine or ten inches long were used for drilling. These bits were welded to a short piece of ¾-in. pipe, and as drilling progressed 6- and 12-ft. lengths of pipe were screwed on as needed. In drilling, the auger was twisted a few revolutions with an 18-in. pipe wrench and then pulled out. It was necessary to have a small amount of water in the drill hole to make the clay stick to the bit. Clay sticking in the flute of the bit was removed for a sample. Cuttings of every successive eighteen inches in depth were sacked together and given a sample number. Great care must be taken not to allow dirt or other surface material to drop into the hole while drilling.

Two men can prepare, drill, and sample a 30-ft. hole in an eight-hour shift. The work becomes slower as the depth increases, and when the depth of the hole becomes over 15 ft. it is best to have one man stand above the other on a trestle, as the long pipe is too unwieldy to handle from the ground.

The result of this exploration indicated that the clay sought had been eroded north of the lava capping as shown in the generalized north-and-south cross-section of Fig. 2.

On the basis of this exploration it was decided to make the initial cut of the

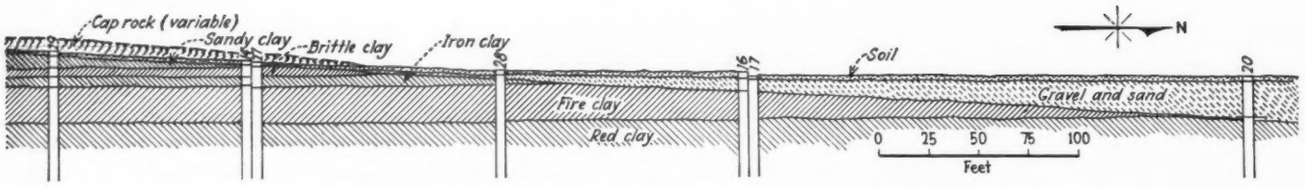


Fig. 2—Vertical section of clay beds, showing drill holes

pit just at the edge of the lava capping. More than 1,000,000 tons of clay is indicated between this line and the plant site.

The spur track was built in June, 1925. It is 1,600 ft. long, is well ballasted, has 90-lb. rail, two cattle guards, a creosoted-plank highway crossing, two derails, a crossing sign, the necessary culverts, and a dirt bumper at the end. As soon as the spur track was laid the construction material was unloaded and actual construction began.

Electric Power Used

The power line was also constructed in June, 1925. A three-wire 11,000-volt line runs from Lincoln to transformers mounted on poles within the property. During the construction period, temporary lines from the transformers were used to operate a power saw, an air compressor, and a lighting system.

The pit equipment consisted of a ¾-yd. gasoline shovel, an eight-ton gasoline locomotive, ten 3-yd. rocker dump cars, and two flat cars. Thirty-pound rail and 6 by 6-in. tires 5 ft. long were used for the railroad.

Pit and Industrial Railroad

The fills for the industrial railroad were built by the gasoline shovel. It was not possible to complete the fills with the shovel by side-casting, as the soil over the lava capping is only about 6 in. deep and the shovel could not dig enough material at the higher points of the fill. The gaps left in the fills were bridged temporarily with cribs of ties and stringers, over which the track was laid. As soon as dirt from the pit was being loaded into cars, these gaps were filled with waste, the timber of the temporary trestles being recovered.

The track gage is 36 in., and 2 per cent is the maximum grade of the industrial railroad. The sharpest curve is on the "Y," and this has a 150-ft. radius. These conditions allow high speeds in hauling.

A branch of the industrial railroad called the "unloading track" parallels the end of the spur track for two car-lengths and serves for unloading incoming clay. Such material arriving in gondolas can be shoveled directly into pit cars for transportation to the storage building.

The so-called "clay track" passes from its fill onto a trestle which runs out over the spur track and so provides for the loading of raw clay into gondolas by dumping directly from the pit cars.

Light Trestle to Waste Dump

At the waste dump the track switches back into the pit. This gives the straight run to the larger or waste tonnage coming from the pit. A "Y" is provided for reversing the locomotive or entire trains.

Since the waste dump is on flat land, the track was built on a trestle as the dump advanced. This trestle was built of 6 by 6-in. posts, a 6 by 6-in. cap, and 8 by 8-in. stringers 18 ft. long. Planks, 2 by 6 in., were used for bracing. Construction of this trestle is illustrated on page 968. The material used was very light, and it was meant to carry only the weight of the empty cars, each car being tripped at the edge of the dump and then shoved ahead on the trestle to allow the next one to be emptied. The posts, caps, bracing, and corbels of the trestle were buried; the stringers were recovered and used again.

Since the initial cut of the pit had to be dug by end-cutting, the locomotive pushed the cars into the pit to bring as many as possible to the shovel. This necessitated running around the "Y" to bring the cars ahead on the waste-dump trestle. Once the waste dump has

Stripping operations with gasoline power shovel

been built out far enough by means of the trestle, this will no longer be necessary.

While making the end cut in the pit, the shovel worked in the center with a track on each side. The shovel could reach about three cars on each side. Nine cars were used in trains of six.

Cycle of Pit Operations

The cycle of operations was as follows: The shovel has just filled three cars on the north track. The locomotive runs six empties on the south track, and there spots three of them, which the shovel proceeds to fill. Then the locomotive, with three empties attached, pulls the three loaded cars from the north track and spots them on the south track, after which it spots the three empties on the north track. The locomotive now picks up the three full ones, adds the three just filled by the shovel on the south track, and runs to the dump. When it returns with the six empties, the cycle is repeated.

The time of a round trip varied as the pit progressed, as the distance from the pit face to the switch varied, and as track laying interfered. Three round trips per hour, or between 50 and 60 cu.yd., was a fair average.

The approach to the pit was carried down on a 2 per cent slope. When the top of the clay had been reached, and stripping was carried ahead on a level, a ditch was carried down the center of the pit behind the shovel. The water from the ditch drained to a sump cut into the side of the pit, and was pumped out once or twice a day as required.

When a season's tonnage of clay has been stripped, the clay is mined with the same equipment and is taken to the plant or loaded directly into gondola cars on the spur track. The plant was in position to ship raw clay on Aug. 16, 1925, and shipped the first car of dried clay from storage on Oct. 30, 1925.

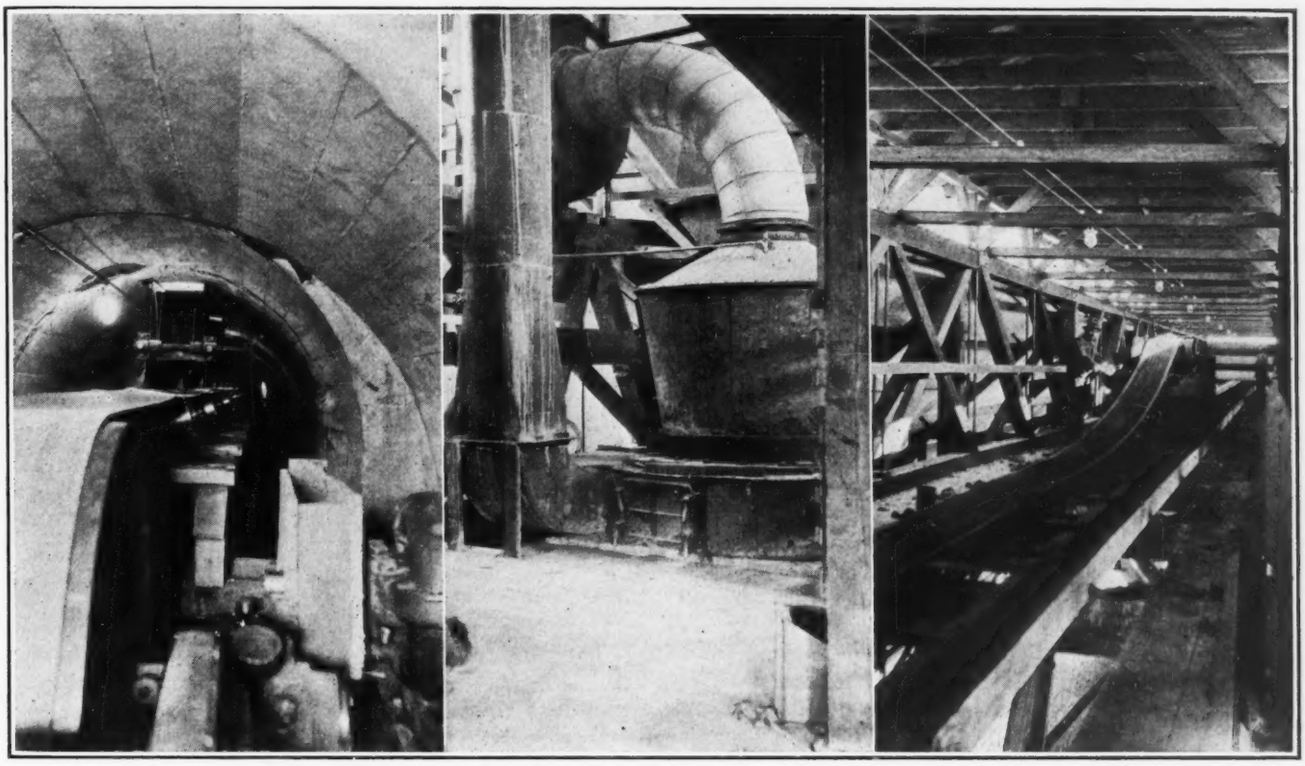
Clay Dried by Natural Ventilation

The clay as mined contains some moisture, and it is desirable to remove as much of this water as possible before shipping. The summer months in Lincoln are hot, and air drying is effective. To aid this drying it was decided to crush the clay to about 2½ in. and to spread and expose it to the air as much as possible.

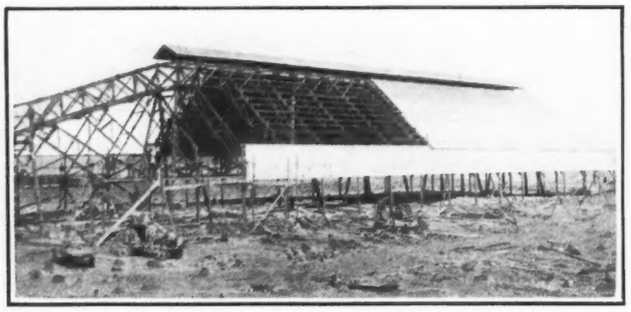
Crushing is done by a 21 by 42-in. single-roll crusher driven by a 40-hp. motor. This crusher is mounted in a pit below the clay-track trestle. The pit cars are dumped directly into a chute and hopper ending in the crusher mouth.

The crusher discharge passes to an 18-in. belt conveyor, 366 ft. long, center to center. This belt conveyor, which is run by a 20-hp. motor, carries the crushed clay to the top of the storage building, where it is discharged from the belt by the self-propelled, self-reversing tripper, operating over a length of 200 ft., shown in the accompanying illustration. In this way the daily tonnage of clay is spread out in a thin layer, giving the hot air sweeping over it in the building the maximum opportunity to carry off the moisture. Drying in this manner is very effective, as indicated by samples taken on successive days.

The construction of the storage building is well shown in the illustration. Five double bents, 40 ft. high and 50 ft. apart on centers, carry a Howe truss. Roof trusses are carried by the Howe truss on one end and by a 6 by 8-in. post on the other. The Howe truss at the end is inclined toward the crusher house, and a trestle carries the conveyor belt stringers between the building proper and the crusher pit. The sides of the



Reclaiming tunnel and conveyor *Raymond mill for grinding clay* *Automatic tripper above storage bin*



Storage building in course of construction

building, which is about 300 ft. long and 70 ft. wide, are sheeted in part only. Above the Howe truss the roof is raised. This construction allows the air to enter at the bottom, sweep up over the clay pile, and escape under the roof over the Howe truss.

Concrete Reclaiming Tunnel

A concrete tunnel was built under the floor of the storage building. This tunnel has a semicircular top, and runs the full length of the building. Twenty-five arc gates at 10-ft. centers are provided in the tunnel top. These gates discharge the clay stored above the tunnel to an 18-in. belt conveyor, 265 ft. long center to center, which is driven by a 15-hp. motor. This reclaiming conveyor carries the clay to a cross tunnel at one end of the storage building, where the clay drops to an inclined-belt conveyor running up into the mill building. The cross conveyor is 18 in. wide, 172 ft. center to center, and is driven by a 15-hp. motor.

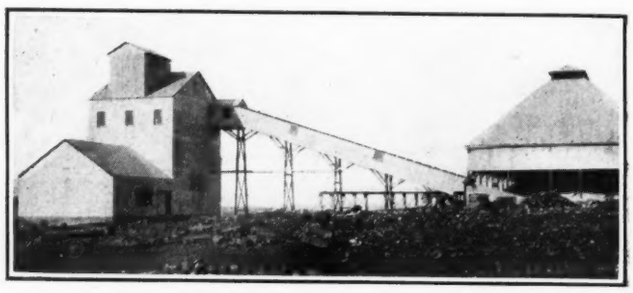
When methods of storing and reclaiming the clay were first discussed it was thought doubtful whether clay from a 40-ft. pile would run through the tunnel gates and various ways of overcoming possible hang-ups were considered. Despite the uncertainty, this method was adopted, since even if the clay would not run in all gates, certainly it would be possible to feed the clay into the end gate under the pile by barring or shooting from above. This would of course necessitate an extra man and would be disadvantageous to the drying, because uniform spreading of the clay in thin layers presupposes even drawing of the pile. So far, little or no trouble has been had from hang-ups. The clay is somewhat slick and runs well. All tunnel gates are operated by hand, as the extra cost of mechanically operated gates is not warranted.

Product Is Finely Ground

The crushed and dried clay comes into the top of the mill building on the belt conveyor, and from it is discharged to one of three 50-ton bins, into either of the first two over which it passes by being scraped off or into the last one by end discharge.

From the end bin the clay can be drawn through chutes in the wall of the building, directly into railroad cars on the spur track. From any or all three of these bins the clay can be fed with apron feeders to a chute leading to a five-roller low-side Raymond mill. The three bin feeders are operated by a 2-hp. motor. The Raymond mill is run by a 60-hp. motor and its fan is run by a 40-hp. motor.

From the Raymond mill the ground clay is blown to a cyclone collector in the top of the mill building. The collector discharges to any one of three 50-ton bins set opposite the raw-clay bins in the grinding room. The ground-clay bins are fitted with three sacking spouts each, and the sacked ground clay is stored in the storage room, from which it is trucked into cars on the spur track. Air separation in the Raymond mill assures fineness of grinding, and the ground clay product is of superior quality.



Mill building and conveyor from reclaiming tunnel

The pit is operated in the dry season between May and December. Aside from the men engaged on track work, which can be done in two weeks at the start of the season, the normal plant force consists of the superintendent and the pit men, including one shovel runner, one shovel swamper, one locomotive driver, and one car dumper. Two men operate the plant, one to attend the crusher and one to look after the conveyor belts. This is the minimum crew in summer, which is generally augmented by two or three men loading or unloading cars and doing miscellaneous work. In the wet season two men only attend to the shipping and grinding.

The clay weighs about 120 lb. per cubic foot in place, and increases about 25 per cent in volume on being broken. A pit car holds about 9,000 lb., or 3½ cu.yd. The crusher will handle a train of five cars in about twenty minutes, the time necessary to make a round trip from the pit. At three five-car trains per hour, of 9,000 lb. per car, the production is slightly over 540 tons per eight-hour day.

Capacity for Storing 18,000 Tons

The maximum quantity of clay that can be put in the storage building is about 18,000 tons. Its total storage then can be filled in about six six-day weeks.

Mining the clay by shovel, crushing and spreading it, and then drawing over the length of the pile, as is done at this plant, has the further advantage of thoroughly mixing the clay. The product as shipped is not only crushed and thoroughly dried but is also of a very uniform quality.

Waste-dump trestle

Useful Operating Ideas

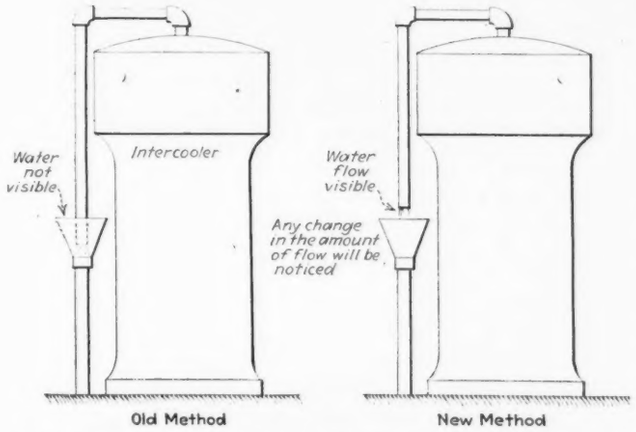


Fig. 1—Pipe arrangement for cooling water discharge

Rehabilitating an Air Compressor

By D. Welge
Consulting Electrical Engineer, Hobart Building, San Francisco

Repairs to and the general conditioning of a mine air-compressor installation with a view to increase of efficiency and the elimination of various difficulties presented an interesting problem the details of which are of interest to master mechanics and others having to do with air compressors.

A thorough overhauling of the compressor was out of the question, as it had to be maintained in operation, and spare parts such as inlet valves, piston rings, and the like were not available. The operating condition of the compressor was good enough, but many little

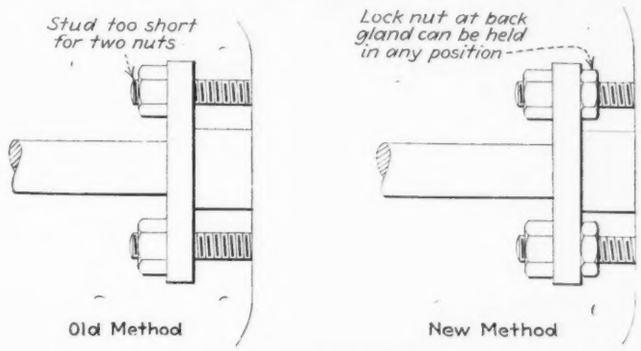


Fig. 2—Lock nuts used on packing glands of air compressor

details required attention. First of these was cleanliness. A place was provided for all tools, packing, separate parts, and other small items. A special case was provided to hold new waste, avoiding the careless practice of throwing it into a corner of the compressor room. The compressor, which was of an old type, was built without oil gutters to catch the drips or oil thrown from the bearings. Sacks had been placed upon the floor to catch the drip. These were removed and drip pans and splash guards constructed to fit all necessary places about the machine. Oil caught was filtered and used again in places where high-grade oil was not esential.

The next feature was to reduce the length of the pipe discharging water from the intercooler. The purpose of this was to enable the compressor attendant to see the stream of water discharged so that any interference with the water flow could be readily detected. Fig. 1 represents the condition as remedied.

The piston-rod gland on the high-pressure crank end was held in place by single nuts as the stud bolts were too short to accommodate lock nuts. As a consequence the nuts worked loose when the gland was loose enough to prevent the packing from burning. When the gland was tightened sufficiently to prevent leakage, the packing would be burnt. The difficulty was overcome by placing thin nuts back of the packing gland as shown in Fig. 2. In this way the packing gland could be held in place with sufficient pressure to overcome leaking but loose enough to prevent undue pressure upon the packing.

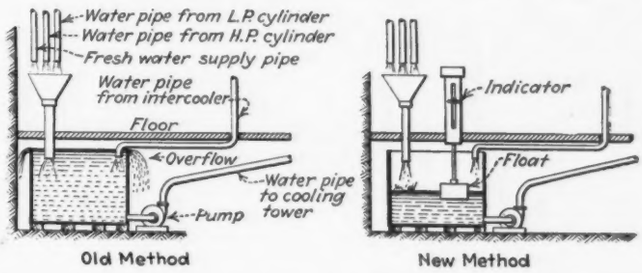


Fig. 3—Tank for receiving cooler water

The water discharge from the intercooler and the cylinders was collected in a tank under the compressor-room floor and returned to the cooling tower by a small centrifugal. When the amount of flow exceeded the capacity of the centrifugal pump, the water in the tank would rise and overflow. The tank was fitted with a float indicator as shown in Fig. 3. This enabled the

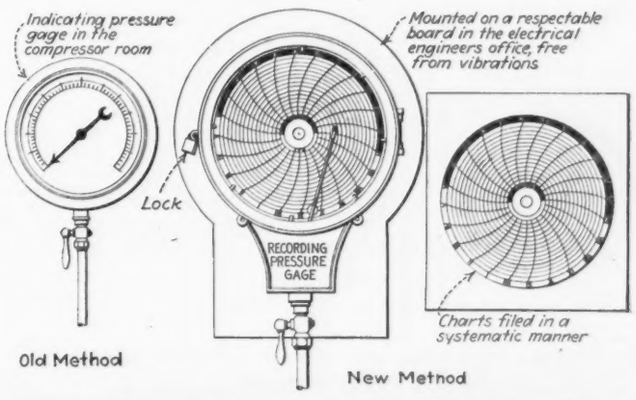

Indicating pressure gage in the compressor room
Mounted on a respectable board in the electrical engineers office, free from vibrations
Lock
RECORDING PRESSURE GAGE
Charts filed in a systematic manner
Old Method
New Method

Fig. 4—Recording pressure gage supplants ordinary pressure gage

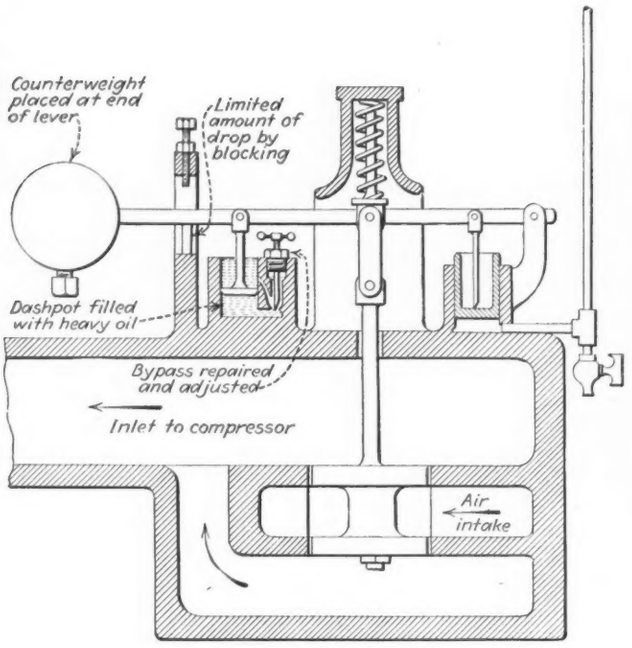

Counterweight placed at end of lever
Limited amount of drop by blocking
Dashpot filled with heavy oil
Bypass repaired and adjusted
Inlet to compressor
Air intake

Fig. 5—Unloader rig on air compressor

attendant to know at all times the height of water in the tank and to regulate the amount of flow accordingly.

A recording pressure gage was installed, and the first few records indicated the dubious condition of the compressor. The air pressure, because of faulty operation of the unloader, fluctuated through a range of 30 lb. Operating pressure was 90 lb. Wide range in air pressure caused trouble and lost time at the drills. The recording gage gave a complete record of compressor operation and eliminated controversies between mine and surface plant operators. A new unloader, Fig. 5, was devised to remedy the pressure variation. By experimentation, the counterweights, adjusting levers, dashpots and other details of the unloader were brought into line. It was found that the best results were obtained by the use of a heavy oil in the dashpot and an accurate bypass adjustment. The counterweight was placed at the end of the lever and the amount of drop of the counterbalance was limited as shown in the figure. The result of this work was to reduce the pressure variation to reasonable limits, five pounds above or below 100 lb. pressure.

Another operating difficulty was the excess moisture in the compressed air. An investigation to determine the presence of leaks by which cooling water could get into the system indicated the real cause of trouble, which was in the position of the air line to the mill. This was cut into the air line to the mine at the lowest point and received the condensed water which accumulated in the pipe line. The condition is shown in the upper sketch of Fig. 6. The piping was redesigned as shown in the lower part of Fig. 6. A water receiver consisting of an old hot-water boiler was placed at the low point of the mine air line and served to remove all of the water. The mill air line was cut into the main close to the receiver.

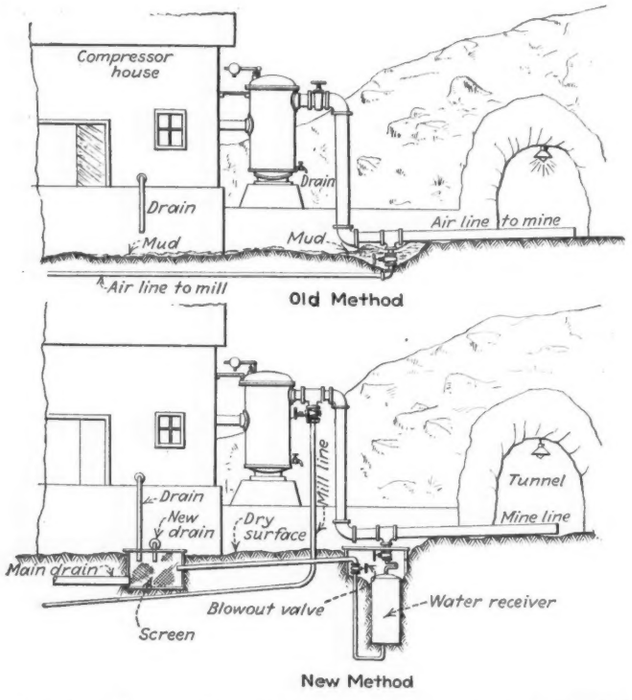
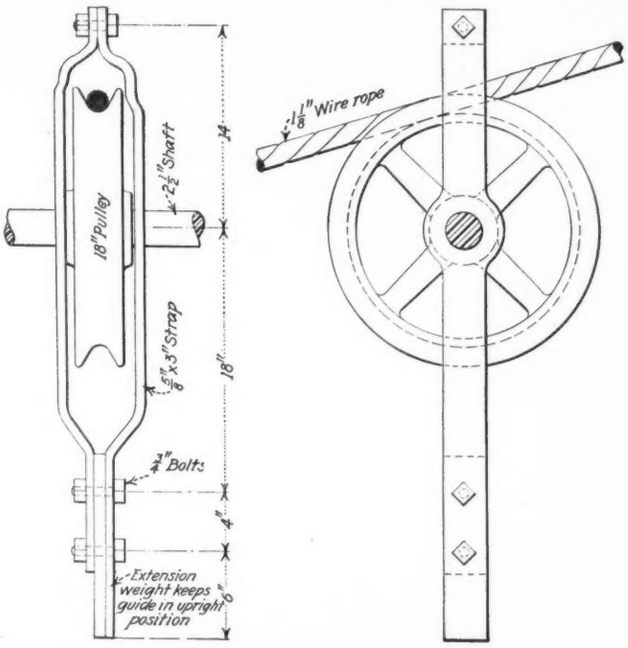


Fig. 6—Change in air piping arrangement eliminates water in air lines

Rope Guide for Idler Sheaves

By L. C. Moore
Hibbing, Minn.

A device for preventing hoisting ropes from jumping off idler sheaves was successfully used at the Stevenson mine of the McKinney Steel Co., on the Mesabi Range. The guide is constructed of two $\frac{5}{8}$ by



Guide for idler sheaves, in upright position

3-in. iron flats, which are bored to pass over the shaft as shown in the accompanying sketch and are shaped to give a small clearance to the upper rim of the sheave. The side pieces are extended so as to bring the center of gravity of the guide below the center of the shaft. There is plenty of room for the hoisting rope to play, but the guide prevents the rope from losing the groove of the sheave. Very little wear results, as the guide is moved along the shaft by the hub of the sheave.

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief. Letters will not be printed unless the author's name and address are known to the editor.

The Wolf in Sheep's Clothing

THE EDITOR:

Sir—Recently the energetic dean of a rapidly growing Western mining school piloted me with justifiable pride through the different departments of his school on visitors' day. From this visit I carried away two impressions, the first being that if I were young again and could begin all over as a mining student, handling such wonderful modern equipment and attending such absorbing lectures by master specialists, I would probably be much further from the bottom of my profession now, at middle age, than I actually am. The second impression was that, with all this multitudinous array of teaching talent, together with the best equipment that science and money can devise, there was one thing lacking—one very important thing—and that was a department of business and accounting.

In the early 90's a four-year course in a mining school included no facilities for acquiring a knowledge of business and accounting. Do such facilities exist today at any American technical school? If so, are such facilities commensurate with the importance of the subject?

Looking backward I can recall in my own checkered career the principal reasons why it was checkered; and they had to do with the fact that during my entire school life no one ever said anything to me about business or bookkeeping or cost accounting. In those days, after graduation a bookkeeper occupied no large place in my mind, he being useful only to pass me my pay checks and, altogether too frequently, my time checks. Today the bookkeeper, disguised as an accountant or an auditor, is the highest paid individual associated with me. His smile or his frown means to me the difference between good management (or is it good luck or a good mine) and poor management (which is simply another name for red ink).

Something ought to be done about it. As I have said, if I had only graduated with a thorough knowledge of accounting and cost keeping I would today be playing golf on some Eastern seaside course instead of being forced to spend another hot summer in Arizona.

After all, the primary business of a mining engineer is to find ore and take it out at a profit. If, in doing this, his side partner or chief assistant is an accomplished accountant, success is about 100 per cent more likely than if he "arrives" at his profit by conducting a guessing contest or by the hazardous method of deducting his payroll from the sum total of his smelter returns. The business world today knows that the mining engineer or mine operator who employs high-grade clerical talent and expert accountants is probably soon going to be or is already successful. Then why not take the technical student of today by the neck and teach him all these business essentials early in the game? Just look at the grief that I should have avoided time and again if I had been earlier inculcated with wholesome respect for the man in the business office. Technology and science, and even practical experience, without business knowledge is valuable and interesting but seldom profitable.

This month another batch of verdant young hopefuls will be turned loose to help find and operate mines. We older fellows know that only a small percentage of these "starters" are going to succeed in mining; and that the statistics show that in twenty years from now most of this year's graduates will be found in some other work. All this means a lot of waste of good material superbly equipped in every way except in the necessary knowledge and appreciation of the importance of the business branch of their profession—especially that part of the business dealing with cost accounting. The executives of our mining schools are not now turning out finished products. They are turning out half-baked scientists. Give the boys a chance. How easily this situation could be improved by injecting into the technical school curriculum a large dose of business ethics and bookkeeping and inculcating a vast degree of respect for the expert accountant and his place in the business of successful mine operation.

The boys today are about to receive their coveted sheepskins, and are busy listening to scores of platitudinous commencement orations. This is one oration they won't hear—There is a wolf in that sheepskin and that wolf is the handicap due to an ill-balanced curriculum for which the school faculties alone are to blame. This handicap will be more easily overcome and success will be more certain if the young mining engineer will remember that it doesn't make a particle of difference whether the intrusive rock under his feet, in his mine, is andesite or dacite, but that it does make all the difference in the world whether or not his chief assistant, guide, counselor, and friend is an able, experienced mine accountant. Cherish him and *pay* him.

Tucson, Ariz. PERCY WILLIAMS.

Suppose Coon Butte Be Made a Testing Ground for Mineral-Location Devices

THE EDITOR:

Sir—The recent discussion as to the origin of Coon Butte, in Arizona, whether it is the result of the impact of a meteor or was formed by some other agency, causes me to propose that the Butte be made a testing

ground for mineral-locating devices. The country has been flooded in recent years with various and sundry schemes and machines for the location of subsurface mineral deposits, particularly salt and oil. Thus we have torsion balances, seismographs, sonic depth finders, and magnetic and electric contrivances almost innumerable. The proponent of each apparatus usually maintains that positive results can be obtained.

Coon Butte would seem to be an admirable testing ground for such machines. There we have, or suppose we have, a huge mass of meteoric iron buried in sedimentary rocks at a depth readily reached by modern mining and drilling methods. The chief difficulty in the way of locating the meteor seems to be the determination of its exact position with reference to the crater. With so large a mass, differing so much from its surroundings in specific gravity, hardness and magnetic properties, the machines for which so much is claimed should be able to locate the body very exactly in both horizontal and vertical planes. If the designer of a mineral-locating device was able to say "I located the meteor at Coon Butte within — inches" he would have an excellent point for his advertising. It is conceivable that the greatest use to which the meteor will be put, if found, will be in the testing of such instruments, if a thoroughly practicable model is developed; and it is even possible that a factory might be located there because of this advantage.

At any rate, when an enthusiast says "I have a device which will locate an oil sand accurately within 50 ft.," is not the prospective purchaser entitled to ask "What will it do with the meteor at Coon Butte?"

San Francisco, Calif. G. DALLAS HANNA.

The Ruling Habit

THE EDITOR:

Sir—The present controversy in the "Discussion" columns of your paper regarding the use of the metric system reminds me of scientific use of the metric units. A recent article in the *American Mineralogist* shows the wide use of the French system in mineralogy. For example, a certain mineral occurrence is described as "30 centimeters in girth and weighing 27 pounds," and opposite is an illustration of the specimen, with a 6-in. rule to show the relative size. GILBERT HART.

Birmingham, Ala.

Too Much Open Forum?

THE EDITOR:

Sir—To the unfortunate members of the mining industry who dig and prospect in the ground, it seems as if entirely too much parking space is allowed to mining "politicians" with more or less skillfully concealed axes to grind and petty controversies to perpetuate, most of which are but the net result of slightly inflamed egos seeking gladiatorial combat on the slightest pretext, but which benefit no one, and merely contribute to the gayety of the nations.

The *Engineering and Mining Journal-Press* is manifestly far too valuable and vastly useful to millions of practical hard-working men the world over to allow much latitude to the literary windmills and the almost engineers who mainly dwell in well-merited obscurity until some overindulgent editor lifts the lid and allows them to lay a barrage on the unsuspecting and semi-innocent public.

If these highly ornamental word-jugglers who fringe the mining industry at every golden angle, and have brought it to the verge of ruin as frequently as possible, were possessed of perception and horse sense enough to realize in what low esteem they are held by the men who do the work, they might welcome the passage of a Verbal Volstead Act designed to curb their pernicious activities on the printed page. EARL C. DART.

Battle Mountain, Nev.

Credit to James Swinburne

THE EDITOR:

Sir—In the short article entitled "Foreign Developments in the Metallurgy of Zinc," in the April 24 issue of *Engineering and Mining Journal-Press*, Mr. Sharpe made a slight error in intimating that my process for the treatment of complex ores, known as "New Metallurgy," was based on an original discovery of my own. The "original discovery" referred to in the last paragraph of the article is due to Mr. James Swinburne, F.R.S., with whom I was in partnership at that date—viz., 1898-1903. The subsequent inventions are my own as stated. EDGAR A. ASHCROFT.

Waye, near Ashburton, S. Devon, England.

The Selenium Supply

THE EDITOR:

Sir—I read your editorial entitled "The Selenium Supply Problem" in the issue of April 24, 1926. Joseph B. Umpleby, in "Geology and Ore Deposits of Lemhi County, Idaho," Bulletin 528, pages 55, 56 and 57, claims that he found a strong trace of selenium in a specimen from the Monument vein, at Myers Cove, and he also speaks of its probable presence at Parker Mountain and the possibility that it will be found in the primary ore at Musgrove. Ray Wickham, who milled some of the gold-silver ore from the Musgrove, claims that it showed selenium. I have a shoot of ore adjoining the Musgrove mine, that assays $5 to $16.40 in gold and up to 3 oz. of silver, and is from 2 to 10 ft. wide by 300 ft. long. Anyone interested in the selenium supply should investigate these veins.

Salmon, Idaho. A. C. LUDWIG.

Iodine and Goiter

THE EDITOR:

Sir—An article, "Salmon in a Diet for the Prophylaxis of Goiter," in *The Journal of the American Medical Association*, for May 1, 1926, reminds me of your editorial "Salt and Iodine," in the issue of March 28, 1925. There you discuss the value of iodine in iodized salt made by a certain company. The writers of the article I cite appear to prove their case that the systematic use of sea foods, particularly salmon (fresh or canned), which are rich in iodine, would be of considerable benefit in treatment of simple goiter. In the same issue of *J. A. M. A.* is also an article, "Iodized Salt in the Prevention of Goiter."

I mention these references in case any mining companies or engineers desire to follow up your note on the subject, when concerned with the health and welfare of their employees. M. W. VON BERNEWITZ.

Pittsburgh, Pa.

Consultation

Sperrylite: An Arsenide of Platinum

"I am interested in getting an understanding of the mineral sperrylite. I have a mineral that when roasted and dissolved with acid leaves a trace of black sediment. I should like to know the tests for sperrylite."

According to Dana sperrylite was named after F. L. Sperry, of Sudbury, Ontario, who first called attention to the mineral. It crystallizes in minute crystals, usually in cubes, or cubo-octahedrons; dodecahedral and pyritohedral faces are rare. The following data may help you:

Physical characteristics—Fracture conchoidal. Brittle. H = 6-7. G = 10.602. Luster metallic, brilliant. Color tin-white. Streak black. Opaque.

Composition—Platinum arsenide, $PtAs_2$ = arsenic 43.5, platinum 56.5 = 100. Antimony and rhodium are also present in small quantities.

Analysis—After H. L. Wells

As	Sb	Pt	Rh	Pd	Fe	
40.98	0.50	52.57	0.72	tr.	0.07	SnO_2 4.62 = 99.46

Pyrognostic character—Before blowpipe decrepitates slightly. In the closed tube remains unchanged at the fusing point of glass. In the open tube gives readily a sublimate of arsenic trioxide and does not fuse if slowly roasted, but if rapidly heated it melts very easily after losing a part of the arsenic. When dropped on a red-hot platinum foil, instantly melts, gives off white fumes of arsenic trioxide having little or no odor, and porous excrescences are formed on the platinum which do not differ in color from the untouched foil.

Observations—Found at the gold-quartz Vermillion mine, district of Algoma, 22 miles west of Sudbury, Ontario, Canada; occurs with pyrite, chalcopyrite, and cassiterite as a loose material occupying small pockets in the decomposed ore. Also probably present in small amount disseminated through a nickel-iron sulphide.

Authorities on Mining Law

"Where can I obtain reliable information on the law applying to mining claims and property?"

A comprehensive and clear description of the entire question of mining law is to be found in Peele's "Mining Engineers' Hand Book" in a section written by the late Horace Winchell. The following works on mining law are also recognized as authoritative:

Shamel: "Mining, Mineral and Geological Law."
Morrison's "Mining Rights."
Rickett's "Manual of American Mining Law."
"Lindley on Mines."
"Wilson's Mining Law."

Who Produced the World's Copper in 1925?

"We note with interest the article on page 869 in the issue of *Engineering and Mining Journal-Press* of May 22, and are wondering if a more nearly complete list showing the entire 3,175,000,000 lb. of copper produced last year is available from any source. If so, we should like very much to have the data published."

The table to which the inquiry refers is reproduced in part below. It should be explained that the figure given for Anaconda includes copper in Butte & Superior, East Butte, and other customs ores. From Anaconda's own ore the production is 236.0 millions.

Copper Producers in 1925

	Company	Location	Millions of Pounds
1	Anaconda	Montana	266.4
2	Chile	Chile	219.5
3	Utah	Utah	214.2
4	Phelps Dodge	Arizona and Mexico	207.2
5	Union Minière	Africa	198.8
6	Braden	Chile	154.1
7	Ray-Chino	Arizona, New Mexico	142.1
8	United Verde	Arizona	108.2
9	Calumet & Hecla	Michigan	94.2
10	Inspiration	Arizona	81.9
11	Cerro de Pasco	Peru	79.0
12	Nevada "Con"	Nevada	73.7
13	New Cornelia	Arizona	69.3
14	Miami	Arizona	51.8
15	Calumet & Arizona	Arizona	44.6
16	U. V. X.	Arizona	43.7
17	Kennecott	Alaska	42.8
18	Granby	British Columbia	37.6
19	Furukawa	Japan	35.2
20	Sumitomo	Japan	31.0
21	Cananea	Mexico	30.5
22	Mother Lode	Alaska	30.3
23	Britannia	British Columbia	29.2
24	Old Dominion	Arizona	27.3
25	Magma	Arizona	27.0
	Total		2,339.6

The figures shown above are for the largest twenty-five producers. The world production for 1925 was 3,173.0 millions, according to the latest estimates, and the remainder is accounted for in the following table, in which the "residual" figures are based on the difference between the output of specific companies and the totals for the different regions as given by the new issue of the "Year Book" of the American Bureau of Metal Statistics:

	Millions of Pounds
Arizona Commercial, Arizona	7.86
Consolidated Coppermines, Nevada	4.38
Copper Range, Michigan	23.27
Engels, California	15.18
Iron Cap, Arizona	4.56
Mohawk, Michigan	16.38
Mammoth, California	(a) 10.0
Ohio Copper, Utah	6.26
Quincy, Michigan	14.35
Shattuck-Denn, Arizona	1.82
Superior & Boston, Arizona	1.00
Tennessee Copper, Tennessee	13.62
Utah Apex, Utah	4.80
Ducktown S. C. & I., Tennessee	4.71
Eighty Five Mining Co., New Mexico	(a) 4.00
Walker, California	(a) 15.00
Matahambre, Cuba	26.20
Boleo, Mexico	16.62
Mazapil, Mexico	(a) 7.00
International Nickel, Canada	(a) 25.00
Mond Nickel, Canada	(a) 12.00
Asarco, Mexico	(a) 20.00
Peñoles	(a) 2.00
Mount Lyell, Australia	14.66
Mount Morgan, Australia	6.28
Naltagua, Chile	10.00
S. A. Copper Syndicate, Venezuela	(a) 3.00
Corocoro United, Bolivia	(a) 15.00
Falcon, Rhodesia	3.80
Mansfeld (Customs), Germany	(a) 40.00
Rio Tinto, Spain	(a) 25.00
Unallocated	
North America	96.49
South America	38.40
Europe	196.90
Asia	87.80
Australia	6.66
Africa	33.76
(a) Conjectural.	833.76

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

CANADIAN House of Commons refutes statements by Braun derogatory to Red Lake; development work well under way.

Santa Fe may build road to Monte Cristo mine, Black Rock district, Arizona—Self-insuring Arizona companies must furnish bond.

Tintic Standard ships 1,000-oz. silver ore—New Cornelia adds another steam shovel—Gladstone Mountain increases dividend.

Central Copper builds townsite at Dos Cabezas—South Lake assessment suit set for June 28.

Manganese Valley mine in New Mexico shipping high-grade ore.

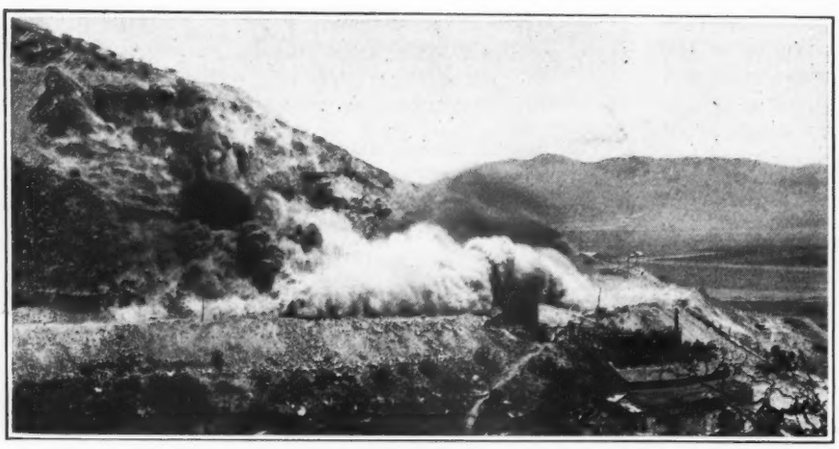
Alabama experiment station, U. S. Bureau of Mines, to be continued—Silver purchase bill passes Senate—Magnesite tariff hearing June 21.

Diamond production of Transvaal increases, while gold decreases slightly — Panama Corporation enthusiasm subsides in London.

Revival of lead-silver mines of Helena district, Montana; past production estimated at $200,000,000.

Geological Survey of Canada to map new mining districts; report on Red Lake issued—Many small mines in Sonora, Mexico, now active.

Calumet & Arizona increases dividend—Ray-Nevada merger completed.



Blast at Monolith quarry, Monolith, Calif., May 9, 1926

Quarry Blast Loosens 350,000 Tons

On May 9, 1926, a large blast was set off in the quarry of the Monolith Portland Cement Co. at Monolith, Calif. A main tunnel was driven from the quarry level, and two branches were extended on either side. The total length of tunnel driven was 430 ft. Explosives were distributed in 21 pockets and aggregated 106,000 lb. of 10 per cent and 6,000 lb. of 60 per cent dynamite. Detonation was effected by cordeau and electric blasting caps. It is estimated that the blast loosened up 350,000 tons of limestone rock.

Sale of Western Lead Mines Stock Prohibited

Sales of C. C. Julian's Western Lead Mines stock on the Los Angeles Stock Exchange were stopped automatically by a decision handed down by Chief Deputy Corporation Commissioner Walther in which he declared that from "the evidence introduced at the hearing it is my opinion that the sale of shares of the capital stock of the Western Lead Mines Co., a Nevada corporation, in the State of California, would be unfair, unjust and inequitable to the purchasers thereof."

Immediately after the opinion was written notices were sent by the commission to Los Angeles brokers who have been handling the stock.

After using several pages to review a number of Julian's advertisements, Deputy Walther declared:

"Many of these advertisements were extremely extravagant, sensational, and flamboyant in character, and it appears from the evidence that they were not justified from the facts and contained statements which the evidence shows were incorrect. They were apparently designed to encourage and urge the investing public to purchase the stock."

Arizona Companies Not Carrying Liability Insurance Must Deposit Bond

Employers in the State of Arizona who desire to become self-insurers under the workmen's compensation law must deposit a bond of $100,000 with the Industrial Commission of Arizona, to guarantee payment of the compensation.

All companies employing more than five individuals are compelled by the recent state law to carry insurance, either with the state or with some reliable insurance company, to protect their employees in the event of accident. Those electing to do so may carry their own insurance, provided they deposit a bond as above set forth. The only self-insurers in the state are the Southern Pacific and the Santa Fe railroad companies; the telegraph and the telephone companies and practically all the mining companies prefer to carry insurance in some reliable insurance company.

Statements by Braun Refuted in Canadian House of Commons

Absolute denial of statements contained in newspaper interviews said to have been given by W. F. Braun, a Pittsburgh mining engineer, on the Red Lake district of northern Ontario, was made in the Canadian House of Commons on June 2 by J. R. O'Neill, Conservative member for North Temiskaming. He produced a copy of one of the interviews which appeared in a United States newspaper.

Mr. Braun was reported to have said that "disappointment, hardship, and death await gold seekers in the Red Lake district." The interview went on in this strain, and said that the Cana-

dian Government should stop the rush of persons to the Red Lake district.

Mr. O'Neill declared that the statements were in direct contradiction to the judgment of engineers of reliability and standing, and that they had been widely circulated through United States newspapers and were calculated to give a very incorrect impression in regard to the Red Lake district. Mr. O'Neill said, further, that he had a sworn statement from Captain A. S. Stevens, of Cobalt, that Braun had admitted that he had never visited Red Lake.

The Hon. R. J. Manion, former minister of the Crown, from Fort William, supported Mr. O'Neill's remarks. It was apparent that a great section of Ontario was being slandered by Braun, he said. The Department of Mines doubtless had reports on the Red Lake district, and could do something to counteract the effects of the interviews handed to United States newspapers by Braun.

Santa Fe May Build Railroad to Monte Cristo Mine

According to reports from Wickenburg, Ariz., the locating engineer of the Santa Fe Railroad, who made a survey at the request of the Monte Cristo Mining Co., has reported that a railroad can be built to the mine with a grade not to exceed 2½ per cent. Mining men declare that there are many properties in the Black Rock district which will be able to furnish a large tonnage. It is reported that plans of the Monte Cristo include the electrification of the camp by Fulton-Diesel engines, connected with generators. The Monte Cristo is primarily a silver mine, with copper coming in in the lower levels. Ezra Thayer, of Phoenix, is president and general manager of the company.

Ark Mines Company Reports Ore Find

The Ark Mines Co., of Kettle Falls, Stevens County, Wash., reports breaking into a mineralized zone from a drift running from a raise which it has extended from its 1,170-ft. tunnel in the Silver Queen property. It has stringers of copper ore through the face of the drift. The ore also carries some lead and occasionally a little zinc. This company has been driving its long tunnel for ten years, employing a small force.

J. J. Budd, of Kettle Falls, Wash., was elected president and O. L. Budd, secretary-treasurer at the annual meeting in Spokane on June 1.

Arcadian Consolidated Plans New Surface Plant

Arcadian Consolidated, Houghton, Mich., is negotiating for a new surface plant for its New Baltic shaft, in which operations will be resumed this year. The north drift on the 1,250 level of the New Arcadian shaft is in 1,775 ft. and nearing the point midway between the two shafts. The corresponding level from the New Baltic will be driven south to connect with the north drift.

The Manganese Valley Mine, of Deming, N. M.

Deposit in Faulted Area; High-Grade Ore Shipped During the War; Work Resumed

By Carl F. Schaber
Mining Engineer, Deming, N. M.

THE Manganese Valley mine, 13 miles east of Deming, N. M., is situated on the east flank of the Little Florida Mountains, on and along a tremendous fault that extends the entire length of both the Big Florida and Little Florida Mountains. Manganese ore was first mined here during the war, when several cars of hand-sorted ore was shipped. During the post-war slump, no work was done, and in 1923 R. H. West leased several claims from Warren and Hoagland, the owners. Mr. West has proved by development that the deposit is of considerable magnitude, having at present (May, 1926) in excess of 25,000 tons of ore blocked out that will average 20 per cent metallic manganese.

Face of open stope on South tunnel showing slickenside. Note size of rhyolite fragments

The country rock is a coarse agglomerate made up principally of rhyolite and latite fragments with a lesser showing of gneiss and chert. In this region the cementing material is fine grained and pink in color. The Little Florida Mountains consist of this agglomerate. The deposit occurs along the main fault and has a well marked footwall with coarse slickensides. The main fault strikes north-south, and has a dip to the east of about 70 deg. There has been some cross fracturing. Ore occurs along some of the more prominent of these fractures. A clay gouge from a few inches to four feet thick is next to the footwall and contains disseminated manganese minerals. Next to the gouge is the ore streak proper, which is from 3 to 8 ft. in width. The ore occurs as pyrolusite principally, often in beautiful crystalline form, with lesser amounts of psilomelane and manganite. The gangue consists principally of clay and calcite.

The property is advantageously situated for working by adits. Raises are put up every 30 ft., and the ore is stoped and drawn off through these raises. Eight miners, two on development, produce by hand drilling from forty to fifty tons of ore per day. The ore is trammed to the ore chute at the head of the primary jigs, where a rough classification is made by a 3-in. grizzly with 1-in. and ⅝-in. screens placed below the grizzly. Oversize from the grizzly is hand-sorted as either waste or ore. Undersize from the grizzly passes to a trommel screen, which makes three sizes for the primary jigs—viz., 2 in., 1½ in., and ⅝ in. The secondary jigs handle three sizes, ⅝ to ⅜ in., ⅜ to 3/16 in., and 3/16 to 1/32 in. Fines less than 1/32 in., which consists of about 40 per cent of heads, are piled on the dump to be treated later by table concentration. Owing to the scarcity of water, the jigs are arranged to keep the water in circulation by placing valves in the plungers. The plungers of the jigs are bored with eight 2-in. holes with a valve fitted under each hole. These valves close on the down stroke and open on the up stroke, thus keeping the water in circulation by creating a constant head in the jigging compartment. The water from the jigging compartment flows through a launder to a settling tank and from the settling tank back to the plunger compartment of the jig. The settling tank has a slow-turning drag, and the drain is fitted with a needle valve which discharges once to every revolution of the drag. It is evident that the suction action of the jig is minimized, but this does not appear to affect the efficiency of the operation. The desired result of conserving water is obtained, one ton of concentrates requiring about 160 gallons of water.

Until recently water was hauled by truck from a well about three miles distant. A new well has been sunk, about a mile from the mine, which encountered an ample supply of water at a depth of 120 ft. A pump has been installed and a pipe line is to be laid to take care of another mill unit. The haul to Miesse, the shipping point, is about eight miles. Shipments to date have been made principally to the metallurgical trade at Birmingham, Ala., and Pacific Coast points. Several shipments have been made to the paint trade. The quality of the ore is high, shipments averaging about 70 per cent manganese dioxide.

Tariff Hearing on Magnesite June 21

Pursuant to Section 315 of the tariff act of 1922, a public hearing on magnesite will be held at the office of the United States Tariff Commission in Washington, D. C., at 10 o'clock a.m. on June 21, 1926, at which time all parties interested will be given opportunity to be present, and to be heard with regard to the differences in costs of production and all other facts and conditions enumerated in the tariff act.

News From Washington

By PAUL WOOTON
Special Correspondent

Bureau of Mines Station in Alabama Not to Be Abandoned—Silver Purchase Bill Passed by Senate

THERE is no thought of discontinuing the Southern experiment station of the U. S. Bureau of Mines at Tuscaloosa, Ala. A report that such action was in contemplation has brought a flood of protests to officials of the Bureau in Washington. The fundamental work at Tuscaloosa on the concentration of brown ores has been carried to the point where it is felt the industry should take it up. The equipment may be used by anyone interested in the problem and the personnel which carried on the experiments is available for consultation.

For several years studies have been in progress in Alabama iron mines to determine the effect of faulting and folding on underground operations. That work now has reached the point where observations must be made in other mining districts. Dr. W. R. Crane, the superintendent of the station, who has been doing most of the work on that investigation, is to be relieved, so that he may pursue the study elsewhere. These developments doubtless gave rise to the unfounded report that the station was slated for discontinuance.

Other work in progress at Tuscaloosa includes a study of drainage in the red-iron-ore district. This involves observations of rainfall and run-off and studies of all conditions surrounding the influx of water into mines.

The field work on stream-gaging has been in progress for a year. Formations overlying the mines have been mapped. The work in the field will be completed this summer.

Senate Passes Pittman Silver Purchase Bill

Without a record vote the Senate at its night session on June 8 passed the Pittman bill providing for the purchase of 14,589,730.13 oz. of silver at $1 an ounce, to complete purchases authorized under the original Pittman Act. The bill provides that the silver, together with all other silver bullion purchased under the act, is to be coined into standard silver dollars. Senator Carter Glass, of Virginia, who was absent at the time the vote was taken, later entered a motion to reconsider the bill. It is not expected, however, that this motion will prevail.

Mine-Ventilation Studies by Bureau of Mines

Measurements of the natural ventilation in the Orphan Girl mine, at Butte, are being made by the U. S. Bureau of Mines. After the installation of mechanical ventilation further measurements will be made for purposes of comparison. The Anaconda Copper Mining Co. is co-operating in the work. G. E. McElroy is in charge for the Bureau. A study of ventilation also is to be made at the Tonopah Belmont mine by B. O. Pickard.

Occurrence of irrespirable gas in the gold mines at Cripple Creek is to be made the subject of special study by the Bureau. The work is in charge of V. H. Denny, but he will be assisted by A. C. Fieldner, the Bureau's chief chemist. The assumption is that this gas is carbon dioxide, probably formed by the action of sulphuric acid on the carbonates. The gas is present in the workings only when the barometric pressure is low. A very slight rise in the barometer drives the gas back into the walls.

Mine-Timber Preservation

Experiments with the use of borax and sodium fluoride as preservatives for mine timbers are being undertaken by the U. S. Bureau of Mines at the Athens mine of the Cleveland Cliffs company, at Negaunee, Mich. The forest products laboratory is co-operating, as is the mining company. George M. Hunt and R. M. Wirka, of the forest products laboratory, are supervising the treatment of the timber. As soon as this has been completed, F. C. Gregory, of the Bureau of Mines, will supervise the installation of the timbers in the mine. The company will place untreated timbers and those treated with zinc fluoride along with the experimental sets so that comparative results may be obtained conveniently.

The Story of Copper

C. E. Julihn, of the U. S. Bureau of Mines, will visit the Kennecott mine, in Alaska, this summer in connection with the preparation of the Bureau's film on "The Story of Copper." The Bureau is making an effort also to arrange for a film on gold dredging. It is believed that such a film will stimulate interest in that form of mining and will provide a record of an activity which is waning rapidly.

Tintic Standard Ships High-Grade Silver Ore

Settlement for the richest shipment of silver ore from the Tintic district of Eureka, Utah, in recent years has been received by the Tintic Standard Mining Co. The consignment of 68.68 tons of ore brought, after all smelting and railroad deductions, a total of $43,734. Silver content of the ore amounted to 1,064.6 oz. per ton; gold, 0.236 oz., and lead, slightly less than 5 per cent.

The ore was mined on the 700, 800, and 900 levels, where considerable quantities of the same character of material await exploitation.

The highest-grade silver shipment recorded in the history of the Tintic district was made in 1890, when the Mammoth Mining Co. shipped twenty tons of horn-silver ore that brought a return of $90,000.

No. 3 shaft of the Tintic Standard Mining Co., situated northeast of the No. 2 or the main working shaft, has been connected with the 600 level, thus making four outlets to the surface, which greatly improves ventilating and working facilities.

Following the sudden death of Lewis Merriman, superintendent of the Apex Standard mine of the Chief Consolidated Mining Co., development in the property will be carried on by the Walter Fitch, Jr., Contracting Co. John Enlund, formerly superintendent of the Centennial Eureka, has accepted the position of superintendent of operations at the Independence mine of the Silver Shield Mining Co.

Developments in Manhattan District, Nevada

The Manhattan Union Amalgamated Mines Syndicate, which owns a large acreage in the heart of the Manhattan (Nev.) district, has started a three-compartment shaft as preliminary to the extensive development of its property. This company is controlled by Thomas F. Cole and associates. The new shaft is approximately 3,000 ft. west of the main shaft of the White Caps Gold Mining Co.

White Caps Mine's incline shaft is now 125 ft. below the 1,220 level, and ground and water conditions are much improved, so that better progress can be made. Other work has been started in the Manhattan district, and considerable activity is expected in the district as a whole during the coming year.

Gladstone Mountain Increases Dividend

After paying a half cent a month dividend for sixteen consecutive months. the Gladstone Mountain Mining Co. will pay 1c. on July 10. The payment June 10 was half a cent, as heretofore. The property is in the Boundary district of Stevens County, Wash. The increased rate will amount to $13,220 a month and will bring the total payments of the company by July 10 to $118,980 since dividend payments were initiated in March, 1925. In May this year the company increased its shipments to twenty-four cars per month. The company has signed a contract with the East Helena smelter for its carbonate ore for one year and with the Pennsylvania Smelting & Refining Co. for the sulphide ore, for a like period.

New Cornelia Adds Another Steam Shovel

Surface operations of the New Cornelia Copper Co. at Ajo, Ariz., are to be increased by the addition of a new 5-yd. steam shovel. Eight shovels are now in operation. The company is also contracting for 500 tons of 70-lb. steel rails and 25,000 wood ties for the extension of rail lines from the pit to the concentrator.

Central Copper Company Building Townsite at Dos Cabezas

A contract for the first unit of fourteen houses in a complete townsite being built near Dos Cabezas by the Central Copper Co. has just been let to Laing & Heenan, Phoenix contractors. The town, which will be known as "Mascot," will be approximately 135 miles east of Tucson. An attractive thirty-room hotel, a general store, and a company office building will face the central plaza, in the center of which will be the town park and bandstand. A school, churches and community hall are included in the plans. Each home will be of distinct type of architecture and will not represent the similarity of construction so often found in closed mining towns.

South Lake Assessment Suit on June Calendar

The suit of the South Lake Mining Co. against delinquent stockholders in Houghton County, Mich., for the amount delinquent on a $2 per share assessment called March 4, 1920, will come up in the June term of the circuit court at Houghton, Mich. There are forty-three defendants. A motion has been filed protesting the legality of the suit on the ground that the defendants cannot be sued collectively. Arguments on the motion will be heard June 28, the opening day of the June term. Much interest is being taken in the case, inasmuch as a victory for the mining company will open the way for suits by other companies for amounts due on delinquent assessments still within the statute of limitations.

Wright-Hargreaves Encounters Good Ore

It is officially stated that the development of the south vein of the Wright-Hargreaves mine, Kirkland Lake, Ontario, has revealed high-grade ore in large volume. In putting up a raise from the 1,250 level to the 1,000 level, the work has been in ore which averages upward of $20 to the ton. The vein has a width of 14 to 18 ft. Within a few days the raise will be completed to the 1,000 level, and this will give the main shaft a depth of 1,250 ft.

Last Chance Mine Sold

The Last Chance silver mine, situated at Old Liedendorf, 8 miles south of Lordsburg, N. M., has been sold. The property was owned by R. E. Fitz and associates, of Los Angeles. Ralph R. Allison and E. A. Montgomery are the purchasers. Development work was started at once on the 275 level, and opened a vein of high-grade silver ore, 6 ft. in width; its length has not as yet been determined. Smelter returns from the first carload of ore show an average of 80 oz. of silver to the ton. Another car of this ore will go forward at once to the El Paso smelter.

The main shaft has reached a depth of 400 ft. The new owners are preparing to erect a 100-ton flotation mill at once. This will be situated at the mine, as it is expected that ample water will be developed from the deeper workings.

Ray-Nevada Merger Completed

The stockholders of the Ray Consolidated Copper Co., at a special meeting held May 26, 1926, authorized the sale, to the Nevada Consolidated Copper Co., a corporation of Maine, of all the properties, assets, rights, privileges, and franchises of the Ray company, as an entirety, for $46,157,685 principal amount of Nevada Consolidated Copper Co.'s fifteen-year 5 per cent debentures, bearing date July 1, 1926, plus interest from date to July 1, 1926, equal to 7c. per share, and the assumption by the Nevada company of all the debts and obligations of the Ray. Later, the sale was consummated, and the Nevada debentures are now available for distribution pro rata among the stockholders. The holder of each share of stock of Ray Consolidated Copper Co. is entitled to $15 face value of such Nevada debentures and 7c. per share in cash.

Calumet & Arizona Increases Dividend

THE Calumet & Arizona Mining Co. has declared a dividend of $1.50 per share, payable June 21, to stockholders of record June 4. Dividend action was taken at the quarterly meeting of the board of directors of the company held in Chicago recently. This company has increased its dividends 300 per cent in the last year. A regular quarterly dividend of 50c. was raised to $1 in September, 1925, and the following November it was increased to $1.50, an extra dividend of 50c. being declared in addition to the quarterly one of $1. The recent action of the board of directors marks the third time the company has paid $1.50.

Betty O'Neal Pays 15c. Dividend

On May 15 the Betty O'Neal Mines, Battle Mountain, Nev., paid a dividend of 15c. per share, calling for $69,003. The total dividends paid to date amount to $273,738. Smelter returns on concentrates, Lot No. 152, 37.87 tons, yielded $13,759.73 with silver at 65c. per oz. Two cars of concentrates are at the smelter that should assay as well as Lot. No. 152.

The orebodies now being mined continue to furnish a very satisfactory grade of milling ore. An oreshoot under development from the Northwinze level stope is not decreasing in size or value.

Chibougamau Lake Area, Quebec, Interests Prospectors

According to a report from Haileybury, Ontario, the Chibougamau Lake area of Quebec shows promise of attracting a rush of prospectors this summer. Some interest was evidenced during the winter, and already a number of parties have left or are preparing to leave from Haileybury. So far the extent of the staking done during the winter is unknown. This is an old district, and years ago asbestos and copper were discovered there.

Canadian Geological Survey Maps Temiskaming and Abitibi

The Canadian Geological Survey is sending six exploration parties into the regions of Temiskaming and Abitibi, in Quebec Province. They will revise the maps in the districts and coordinate the work done in this region. It is the intention of the Geological Survey to cover the whole Temiskaming-Abitibi region by a series of maps (twenty sheets). The work will probably require four or five years and will constitute the most detailed and extensive survey ever made in Canada. The map will measure 12 by 8 ft. when completed.

Canadian Government Issues Report on Red Lake

In the latest Red Lake report to be issued, the Ontario Government has made a new and commendable departure from its ordinary procedure. The report describes the geology in a condensed but clear manner, and gives details concerning the means of access and methods of transportation to the property. It tells, in detail, how to acquire a mining claim; the amount of assessment work necessary, and the cost of recording. It also presents data concerning the equipment needed by a prospector and gives a detailed list of food supplies sufficient to last two men for one month.

Though the report was written more with the purpose of giving essential information to the amateur, rather than to the experienced prospector, it nevertheless supplies many useful hints to the latter and has the additional virtue of being authoritative.

Cynide Gold Levies Assessment

The Cynide Gold Mining Co. held its annual meeting at Bonners Ferry, Idaho, on June 1, and levied a 1c. assessment, but did not attempt to amend its articles of incorporation, because the necessary two-thirds majority of the stock was not represented. About 150 stockholders attended. Peter Proff, of Rosalia, Wash., was elected president and George P. Meyers, of Bonners Ferry, secretary-treasurer.

The company is repairing its dam on the Moyie River, and expects to finish this work when the water is lower and to resume milling operations in August.

Belmont Mine Developing Silver-Lead Orebody

Development work at the Belmont mine, Superior, Ariz., is confirming indications of a large high-grade silver-lead orebody. A high-grade ledge was intersected in the Copper Bell vein on the 1,150 level several months ago. Since then a crosscut driven 600 ft. west of the discovery crosscut has penetrated high-grade ore in the same vein. If the values are continuous between the two points of intersection the length of the oreshoot is 827 ft. at least. Assays taken across the vein at the latter intersection show values of 2.5 per cent copper, 6 per cent lead, and $35 in silver.

lowing the Black Hills rush. Marysville, then distinctly a gold camp, maintained its production well into the present century. The established mines worked out the high-grade, secondary ores and continued utilizing the equipment on hand. The process of simple amalgamation was followed, in some cases, by vanner concentration of the sparsely disseminated sulphides. Financial conditions were such as to discourage the development of additional prospects or resort to more economical and efficient methods for the mining and milling of low-grade primary ores of the deeper levels. One "prospect" has since been undertaken in the camp —the Shannon mine of the Barnes-King Development Co., which proved to be the company's one really profitable mining venture, producing $2,700,000 in its six years of operation when abandoned by the company.

Marysville was a "gold camp"; hence, as is so often the case where one metal dominates in production, the lead resources of the camp were neglected, though owners of prospects and leasers have made occasional shipments of gold-silver-lead ores when market conditions were favorable.

Elkhorn (the original Elkhorn), Jefferson County, was essentially a silver producer. Oxidized iron ores carrying gold, copper, or lead were mined in the camp, both as ores and for flux. Camps scattered over the remaining area, and of which the above are typical, contributed to the production of silver and the then incidental lead.

Ores Associated With Boulder Batholith

The southwest quarter of the area shown on the map is covered largely by the surface exposure of the monzonite invasions which extend both south and west beyond the borders of the mapped area, constituting the familiar Boulder batholith. It is from the association with this Boulder batholith that has come not only the production referred to above but the vast wealth of copper, silver, and zinc of the Butte mines. Butte lies just off the southwest border of the mapped area, a few miles south of Elk Park.

Prickley Pear Valley, north of Helena, so named because of the prickley pear found there by the Lewis and Clark expedition, occupies the geographical center of a dome-shaped anticline in the sediments as thrust up by the intrusions of monzonite. The floor of the valley is of Algonkian age. At the northern and eastern rim, intermittently characteristic of its entire boundary, the monzonite is flanked by folded and faulted Pre-Carboniferous sediments dipping southerly toward the batholith. Massive limestone of Mississippian age, extends north to the Missouri River and east to the Big Belt Mountains.

The Mid-Western section on the map is occupied by flows of andesite and andesite breccias determined by the U. S. Geological Survey as antedating the invasion of monzonites. Throughout the region the andesite is unconformable with various sedimentaries and in intrusive contact with monzonite. Over the northern area, and extending beyond the border of the map, is a succession of folds in Pre-Cambrian shales and quartzite.

Ores Found in Shales and Quartzite

The lead-silver and copper-gold-silver veins of Silver Camp are found in this belt of shales and quartzite, as also the Wolf Creek copper-silver deposits. The former are just over the west slope of the Continental Divide; the latter on the eastern slope and 2,500 ft. lower in altitude. Both are associated with dioritic intrusives of undetermined age. Weed, in his report on the Castle Mountain area, easterly along the same belt, places the copper deposits of those mountains as of Pre-Cambrian age. This may be the case with the Wolf Creek deposits. The Wolf Creek-Silver Camp mineral zone lies just off and parallel with the northern border of the mapped area.

Failure to "carry on" is the anomaly of the Montana silver-lead mining districts, a psychological situation aggravated by the lack of a state geological survey and the paucity of scattered and antiquated surveys and reports by the U. S. Geological Survey. The district, as a whole, has been affected by the trend, first toward larger agricultural development and by investment in water-powers by those who had been interested in the mines, and by the conditions which have prevailed in the Butte district for the last twenty-five years.

Resumption of mining for silver-lead, gold, and copper ores, the last from smaller, high-grade, low-cost operations, will have the advantage of improvements recently made in prospecting, mining, milling, transporting, and marketing. The advance in the science of geology will eliminate much of the uncertainty in prospecting and developing; modern mining methods, with electric power distributed throughout the mining districts, will lower the costs; and extended research over the intervening thirty years has increased the possible recoveries as well as made available for marketing metals that were formerly a detriment to the producer. All these combine to make available a larger commercial tonnage to be mined, beneficiated and marketed than in former years.

The optimism and faith of the pioneer miners of the West is something to marvel over as one contemplates the "conservatism" of the adventurers who, these days, make mining a business! Given a vein with some ore in it, those hardy pioneers went after the ore and took it out as they went down without listening to whispered vagaries as to "probabilities."

The East Helena smelter of the American Smelting & Refining Co. is undergoing changes, and additions are being made to adapt it to the larger tonnage available and to the change in character of the products offered for treatment because of flotation and its attendant products.

Present demand for lead and zinc and the prominence of the interests which have been concerned in examination of properties during the last year afford hopeful signs that this, one of the earliest silver-lead districts of the West, will resume a prominent place in the mining industry.

Johannesburg Letter

By John Watson
Special Correspondent

Gold Production Decreases and Diamond Output Increases in First Quarter of Year

Johannesburg, May 4—The local Department of Mines has recently published figures showing the mineral production up to the end of March. The value for the first three months of the current year totaled £13,595,485, which is an increase of £176,121 compared with the output of the same period of 1925.

	Three Months, 1925	January to March 1926
Gold	£10,215,364	£10,142,540
Silver	42,019	32,756
Osmiridium	33,278	26,959
Diamonds	1,958,444	2,203,129
Coal	941,568	920,025
Copper	105,385	134,298
Tin	55,359	70,994
Other minerals	67,947	64,784

Diamond Production in March

On the Transvaal diamond diggings during March, alluvial diamonds to the value of £124,274 were found by 1,589 diggers out of a total of 2,641 working. As compared with February, the value shows an increase of £19,061, while there were thirty-six fewer diggers working; but 113 more diggers registered finds. The diggers enumerated employed 1,617 Europeans and 11,847 native laborers. The richest farm in March was Rovidrai, in the Ventersburg district, where diamonds valued at £12,014 were found by 128 diggers out of 208 working. The next best farm was Leeuwfontein, near Wohnaranstad, where a value of £11,300 was obtained by 175 diggers out of 266 working. A couple of lucky diggers on the farm Zwartplaats, near Ventersdorp, registered finds to the value of £8,453; but they employed 200 other Europeans and about 1,000 natives.

Concessions in Northern Rhodesia Being Prospected

Northern Rhodesia was recently visited by Sir Ernest Oppenheimer, Edmund Davis, of London, C. Hely Hutchinson and Carl Davis, consulting engineer to the Anglo-American Corporation. The new Kasempa concession (extending southwards to the Zambesi and stretching from the Eastern boundary of the Barotse reserve to the railway line) is to be prospected during the next three years at an expenditure of £25,000 per annum. Electrical prospecting will, it is understood, be adopted. Other recent visitors to the Rhodesian Broken Hill properties included Messrs. Read, Carroll and Mars, departmental heads from the original Broken Hill (South Mine), in New South Wales. These three gentlemen are on a trip around the lead-producing centers of the world on their company's behalf.

Natural Gas in Transvaal

There has been for some years a flow of natural gas from a bore hole 600 ft. deep in the Heidelberg district (Transvaal). A recent analysis of this gas showed a high percentage of methane,

Revival of Lead-Silver Mines of the Helena District, in Montana

Improved Metallurgy—Better Transportation, and High Metal Prices Stimulating Factors

By L. S. Ropes
Consulting Engineer, Helena, Mont.

THE demand for lead and zinc and the better price for silver have created a revival of interest in the early silver-lead producing districts of Montana. Prior to 1893 the output compared favorably with that of other sections of the West, as attested by the government statistics. However, with the decline in the price of silver and the then limited demand for lead, Montana camps, with others, suffered a decline from which, with the exception of Butte, they never recovered. Butte, owing to deeper development and the discovery of high-grade copper ores, alone survived.

In the Helena mining region prospectors have returned to the hills, and a number of old prospects, old mines, and tailing and mine dumps have been acquired or leased; and increased shipments are being made to the smelters of Montana and Utah. Engineers, during the last year, have been investigating the possibilities of the region, to which further attention has been given by officials of companies interested in the production of lead, zinc, silver, and gold.

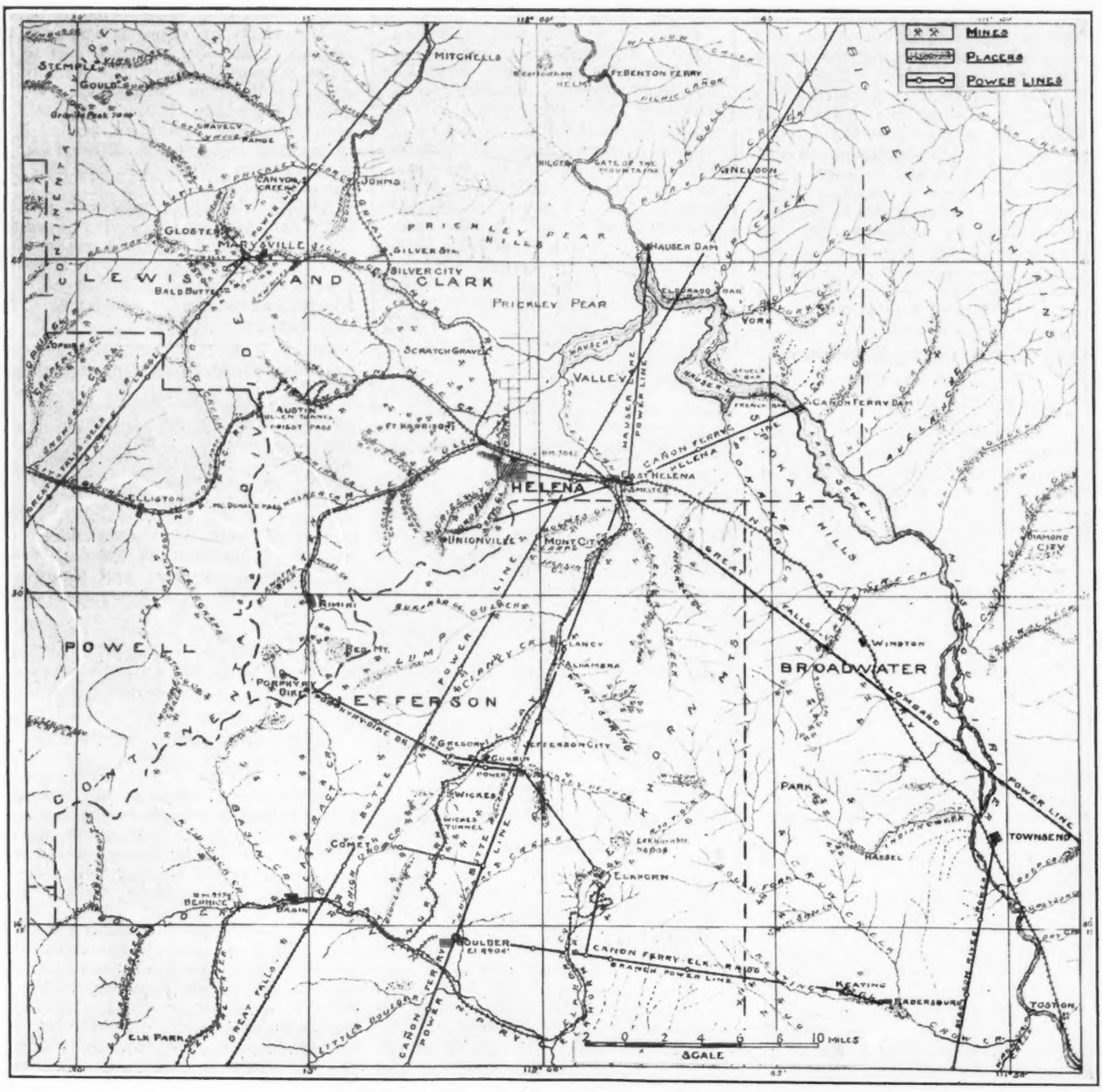
The accompanying map covers practically the northeast quarter of that area which should be properly considered in reviewing the district, which was active from 1860 to 1896. As this quadrant is typical of the remainder, a brief résumé will answer for the entire region.

The output of the Helena mining region prior to 1893 is conservatively estimated under the following headings:

Known production of 161 metal mines..	$170,000,000
Estimated production of 46 metal mines	30,000,000
	$200,000,000
Known production of 35 placer areas....	$70,000,000
Estimated production of 83 placer areas.	30,000,000
	$100,000,000

The main production from the metal mines was gold, silver, and lead. In the later years returns were made by the smelters for copper. Zinc was conspicuous because of the penalty imposed upon the shipper.

The placers ceased to be of importance about 1873, and more attention was given to quartz mining after the return of the Montana wanderers fol-



Map of Helena Mining District, Montana

Situation at the Mines

By Albert H. Fay
Assistant Editor

THERE is an unusual amount of prospecting under way, especially in Ontario, Quebec, and British Columbia, where virgin areas are being searched for precious metals. In Arizona, Colorado, Nevada, and other Western states a renewed interest is manifest in old camps that have been dormant or abandoned for a decade or more. Idaho is busy opening up promising lead-zinc-silver deposits outside the Coeur d'Alene district.

Average Prices, October, 1925, to April, 1926

Period	In Cents Copper	Lead	Zinc	Silver
November, 1925	14.353	9.739	8.614	69.223
December	13.866	9.310	8.565	68.889
Average, 1925	14.042	9.020	7.622	69.065
January, 1926	13.822	9.255	8.304	67.795
February	13.999	9.154	7.759	66.773
March	13.859	8.386	7.332	65.880
April	13.706	7.971	7.001	64.409
May	13.599	7.751	6.821	65.075

The shipping season on the Great Lakes opened about two weeks later than usual, but all the iron companies were ready to ship, and iron ore is now moving in a normal way. Only one new shipper has been reported.

Copper—The Calumet & Arizona Mining Co., Warren, Ariz., has opened up a new high-grade orebody assaying from 7 to 12 per cent copper. The same company is conducting extensive exploration work on a large porphyry deposit 17 miles north of Kingman, Ariz. Legal proceedings of the Idaho Copper Corporation vs. Campbell have been discontinued and a new suit for $500,000 has been filed. Utah Copper has purchased an oil-electric locomotive as an experiment, looking to the elimination of steam locomotives. The Wenden Copper Co., Wenden, Ariz., reports good copper ore on the 650 level. United Verde Copper Co. is sharing the loss of its employees who were so unfortunate as to suffer loss when two local banks in which they were depositors failed. Copper ore, with lead and zinc, is reported in western Quebec as a result of the diamond-drilling campaign. The Noranda company is busy sinking two shafts and installing machinery for the third and central operating shaft. In the Michigan copper district, the Allouez conglomerate has proven disappointing and the Calumet-Hecla has at least temporarily discontinued developments in that lode outside of the limits of the Calumet & Hecla proper. Mohawk has completed its fourth regrinding unit. The Michigan copper mines were the recipient of an increased valuation for state tax purposes. Calumet & Hecla has resumed operation on the Osceola amygdaloid. Refined-copper production in the Michigan district in May is estimated at 15,530,000 lb., of which Calumet & Hecla Consolidated turned out 9,200,000 lb. and Isle Royale, 800,000 lb. Estimated productions of other properties in the district are: Mohawk, 1,400,000; Quincy, 1,200,000; Copper Range, 2,300,000; and Seneca, 630,000. Michigan copper continues to move freely both by rail and water, with the Mid-West taking the bulk of the metal. Shipments are keeping fairly even with production.

The closing of the Anaconda, Steward, and Nettie mines, at Butte, does not mean any reduction in production, as the 850 men employed at those mines are all furnished work at the Anaconda mines in operation, thus bringing the output at those properties up to about capacity.

Gold—The extent of the co-operation of the Quebec Government with the mining interests was illustrated by the Minister of Mines, in announcing recently that nearly half a million dollars will be expended in the townships of Abitibi and Temiskaming by his department this summer. Over $300,000 will be used for improving transportation facilities. The government also announces that it will send several geological parties into that district this summer. The Red Lake mining division has been enlarged by combining it with the Woman Lake and Birch Lake areas in Ontario. Regular water transportation is now in operation to the new gold fields. Diamond drills are at work developing a number of the claims on which promising outcrops have been exposed. Birch Lake, Ontario, is attracting many prospectors, and it is possible that important gold deposits will be found there. Kirkland Lake, Ontario, now is an outstanding gold camp, with a production at the rate of $7,000,000 per year. In British Columbia, the Premier Gold Mining Co. has taken option on Alaska claims near Hyder, Alaska. Katherine Gold Mines Co., Kingman, Ariz., will be reorganized to secure funds for further development and the increase of milling capacity. The Tom Reed mine, in Arizona, is milling about 120 tons of ore per day, and the Flowery mine, in Virginia City, Nev., is milling about 160 tons per day.

Gilbert Milling Co., Gilbert, Nev., has secured a millsite, water rights, and contracts for large ore shipments from the Homestake, Mammoth-Last Hope, and other Gilbert properties, and will soon start construction of a modern plant to treat a large amount of low-grade ore.

Lead-Silver—In British Columbia the large concerns are maintaining output at capacity of their plants. Both the Granby and Consolidated are increasing their milling capacity, the former to 2,750 tons and the latter to 4,000 tons at the Sullivan mine, and it is tuning up the St. Eugene plant, which is designed for 500 tons. The Premier company, too, is maintaining a high output. A large amount of exploration and development is going on in all directions —much larger than last year, which was a record year in this direction. Porcupine Goldfields Development & Finance Co. is said to be planning the expenditure of $2,500,000 for development in British Columbia. It and the Victoria Syndicate have several scouting engineers in the field. Two new silver veins have been reported in the Boundry district. The small mines of the province show an increased production, and demand is now being made for a custom mill on or near the coast to take care of these mines. Tonopah Belmont plans to develop a high-grade ore recently opened at Camp Belmont, near Wickenburg, Ariz. The Hawthorne Mines, Inc., Hawthorne, Nev., is treating 100 tons of ore daily, with concentrates officially reported averaging 500 ounces silver and 30 per cent lead to the ton. Shipments of ore, concentrates and precipitates from the mines of the Bingham, Utah, average 120 carloads per week. These figures are exclusive of the production of the Utah Copper and Utah-Delaware mines.

Lead-Zinc—The Bunker Hill & Sullivan Company of Kellogg, Idaho, is developing an ore deposit at Chelmsford, Ontario, after spending $250,000 in prospecting by the use of diamond drills and trenching. Sunshine mine, at Hockerville, Okla., formerly operated by the Federal Mining & Smelting Co., has been sold to the New Chicago Mines Corporation. The Anna Beaver Mining Co. is erecting a new steel concentrating plant, which is an innovation for the Joplin-Miami district. At Livingston, Wis., the Coker mine, discovered in 1848, has closed down after producing for more than three decades. Developments at Clarksfork, Idaho, are under way to open up the recently discovered lead ore, and similar work is in progress at Lakeview, Idaho, by the Hewer Mining Co.

Zinc—The Callahan Lead & Zinc Co., of Wallace, Idaho, has developed a good orebody and is now planning to build a 150-ton flotation mill. Bunker Hill & Sullivan is planning the installation of an electrolytic zinc plant at Kellogg, Idaho. In the Joplin mining district, mining and milling operations have been somewhat retarded by water shortage as a result of the long-continued drought. The option on the Giesche zinc mines, of Polish Silesia, has been exercised by the Anaconda-Harriman group.

General—A half-million-dollar shipment of tungsten ore from China to Niagara Falls passed through New York City on May 26 consigned to the Crucible Steel Co. It is reported that Temescal tin mines near Corona, Calif., and the tin mines at Tinton, S. D., are to be opened at an early date. The annual welfare report of the United States Steel Corporation shows that $158,000,000 has been spent in fourteen years of safety, sanitation, and welfare work. In accordance with the new mining law, Mexico has cancelled many mining concessions for the non-payment of taxes, and continues to carry out the law against all who fail to pay. As a result of the merger of the two principal power companies in Ontario, a power survey is being made of various mining districts to equalize the rates.

or marsh-gas (CH_4). Indeed, there are said to be eight out of nine probable indications of oil. An American expert is coming to investigate.

On the Johannesburg Stock Exchange, during the past week, gold shares have improved in price, chiefly due to local buying for investment. T. C. Land and platinum shares were quiet up to Thursday, when a demand set in for the former, and the price improved. On the week's balance (up to Saturday noon), T. C. Lands have improved 3s. 3d. from 46s. 9d. to 50s. Potgietersrust platinums have kept about the same price and close the week at 7s. 5d., a gain of 1d. (on the 5s. share) for the week.

Small Mines Active in Sonora

Lewis and Taylor, representatives of the American Smelting & Refining Co., have taken a lease on the Los Animas mine, San Javier, Sonora, where a small oil flotation mill is being operated under the direction of J. A. Hilton. A high-grade sulphide orebody has been opened up. Best ore is being shipped and the milling grade treated at the mill. The same men are constructing a 50-ton flotation mill for treatment of tailings at La Colorado (Minas Prietas), 35 miles southeast of Hermosillo, Sonora, Mexico. This is the old Butters property, where the cyanide process was materially developed. F. W. Williams, backed by Denver capitalists, is opening up a promising vein of silver-lead ore at Santa Rosa in the center of the village.

The San Ignacio, nine miles southeast of San Javier, which produced high-grade ore in the old days, has been unwatered and is being developed by J. Campbell Besley, of Hermosillo, Sonora, Mexico, for New York people. He is working an antimony deposit near La Palma ranch, Tecoripa district.

La Placeritos mine is 35 miles northwest of Hermosillo. It is owned by W. G. Bowman and W. J. Mitchell, of Nogales, Ariz., who are developing orebodies and making regular shipments. This is a good prospect, and has the appearance of making a big mine. Among other properties that are under development are the San Geronimo mine, and Noche Buena, in the Magdalena district.

South African Tungsten Mine Under Development

The U. S. Department of Commerce reports the organization of the South African Tungsten Mines, Ltd., in Cape Town, with a capital of £75,000, for the purpose of exploiting a property in the Kenhardt district of the Cape Province. The prospectus states that there is a clearly defined reef opening to a width of four feet, and it is planned to erect a ten-stamp battery capable of treating 2,000 tons of ore a month.

Laboratory assays show a yield of 5.94 per cent tungstic oxide, but as there will be a 20 per cent loss, the net yield will be about 4.75 per cent. Working costs have been estimated at 20s. per ton of ore, and it is expected that about 145 tons of concentrates containing 65 per cent tungstic oxide will be shipped monthly.

London Letter

By W. A. Doman

Special Correspondent

Panama Gold Enthusiasm Subsides—Gold Values in Lonely Reef (Rhodesia) Decreasing

London, May 25—Since shortly after the flotation of the Panama Corporation, little seems to have been done in the way either of marketing the shares or of developing the properties, which seems to confirm the opinions held at the time that the concession was not ready for offering to the public. Even some supporters of the issue have allowed their enthusiasm to cool. I understand that negotiations are in progress with some English engineers to proceed to the property at a later date.

The reaction in the price of tin to £266 17s. 6d. per ton is attributed to seasonal influences, it being pointed out that frequently at this time of year buyers hold aloof. There can be little doubt, however, that the unfortunate state of trade in this country is also a contributory factor. If the coal strike could be settled, and fuel were available at reasonable prices, engineering firms could put in hand the orders they have received and which are temporarily held up—and some very large contracts have been entered into with foreign firms.

P. K. Horner, consulting engineer to Minerals Separation, Ltd., has just returned from Rhodesia, where he has been inspecting the property of the Southern Rhodesia Base Metals Co. As regards the Copper Queen and Copper King, they are said to possess great possibilities. Little work has as yet been carried out, but the opinion is expressed that important orebodies have been discovered, and that large tonnages of comparatively high-grade sulphide ores of copper, lead, and zinc, with a little silver, await exploitation.

Development at the Lonely Reef (Rhodesia) have not given such good results during recent months, although in certain parts of the mine relatively high values have been encountered. Interest has been centered upon the 25th and 26th levels. The former, during the last calendar year, was extended 222 ft., over which distance the reef averaged 21.8 dwt. over 46.5 in. The 26th level was extended 362 ft. in the footwall schists alongside the hard reef, which had not been broken down at the end of the year, so that full values were not disclosed. As the indications in the 25th and 26th levels north suggested the existence of a new orebody, operations have been concentrated on the extension of both these levels and the upper and adjoining levels, and it is anticipated that if the new orebody continues to open up favorably, a marked improvement in the ore reserves will be shown during the current year. The lowest level in the mine is the 33d, and this is at a depth of 4,050 ft. below the collar of the main shaft. Driving here has only just begun. On the 26th level the driving of 1,407 ft. has shown a length of orebody of 604 ft., with an average value of 13.4 dwt. over 49.8 in. This value is above that of the 25th level. A statement in the report shows that there has been almost continuous depreciation in gold content from the 20th level downward. The ore reserves at Dec. 31 last amounted to 110,307 tons, averaging 12.94 dwt., against 127.782 tons, averaging 13.67 dwt., twelve months earlier.

Yunnan Increases Tin Exports

The customs returns at Mengtze, China, according to the U. S. Department of Commerce, show an exportation of 9,844 short tons of tin in slabs, valued at $10,037,089, from Yunnan in 1925, compared with 7,683 tons, valued at $7,278,103, in the preceding year, the 1925 exportation being about 700 tons more than the average annual export for the ten years 1914 to 1923. With the exception of 123 tons shipped to Tongking, the Mengtze returns credit the entire 1925 shipment to Hongkong.

Ichthyol Deposits in Texas to Be Exploited

A large deposit of ichthyol near Burnet, Tex., is to be developed by the United States Ichthyol Corporation. For several years this deposit has attracted the attention of medical scientists. It has been exploited to some extent commercially, and much has been done in the matter of prospecting the area where the oil is found exuding from the rock formation. Ichthyol is a brown syrupy liquid prepared by the dry distillation of bituminous mineral containing fossil fishes. It is supposed that the deposit in Texas resulted from the recession of the gulf, when millions of fishes and other sea animals were left stranded. Besides an office and laboratory which the company will establish at the mines, general offices and a laboratory will be maintained at Dallas. The latter will be in charge of William H. Mize, acting secretary of the company.

Exploration Work Well Under Way at Red Lake

Active exploration of the Howey property, at Red Lake, northern Ontario, under option to the Dome Mines, Ltd., tends to confirm the expectations entertained as to the value of the deposit. According to an official statement by Douglas Wright, engineer in charge, upward of 4,000 ft. of diamond drilling has so far been accomplished. Three diamond drills are working along the 1,000 ft. in length which has been trenched on the surface. Nine drill holes have been put down to about 450 ft. each in depth. The holes have been drilled at such an angle as to cut the deposit at a vertical depth of about 300 ft.

An important feature is that though drilling began at the west boundary adjacent to the McIntyre boundary, and assays show a good grade of ore at that end, yet the examination of the deposit shows an increasing amount of mineralization at the east end of the deposit. At this point the vein is exceptionally wide, with every indication that the width persists at considerable length.

Societies, Addresses, and Reports

Growth of Flotation in Tri-State District

C. O. Anderson Reviews Progress at Zinc Institute Meeting

A PAPER presented at the annual meeting of the American Zinc Institute held at St. Louis on April 19, by C. O. Anderson, of the Bureau of Mines, reviews the development of flotation practice in the Tri-State zinc-lead district. Excerpts are published below.

The year 1925 witnessed the firm establishment of flotation as an essential part of Tri-State milling. In the last three years great strides have been made in the advancement of flotation in the United States, but during the last year the Tri-State field made more progress in adopting this process than in probably all previous years combined. The reasons for this state of affairs may be divided under two general headings: (1) Improved practice in the jig and table rooms and (2) the extraordinary advance in the knowledge of flotation itself.

The flow sheet of the usual Tri-State flotation plant is today about as follows: Most of the mills employing flotation have sufficient lead in the feed to justify the differential method. This usually requires either three or four four-cell machines. The last two machines are termed zinc machines; the one or two preceding ones are the lead machines. Usually a concentrating plant of thirty tons per hour capacity has a Dorr thickener of 50 ft. diameter, which receives all overflows from the table room. At some mills the tailings from the fine-sand tables are sent to the thickener. Except for a few instances, where ball mills operating in the table room contribute to the slimes sent to the thickener, the fines which reach the flotation machines via the thickener are the unavoidable fines produced in the blasting underground and in the jig-room grinding devices.

Thickener overflow passes to waste, and the spigot is attached to a diaphragm pump which sends the thickened pulp either direct or by way of an elevator to a small feed cone which discharges into the lead machine. Usually the reagents are added at the head of the machine. The lead froth is tabled to produce a high-grade concentrate and the table side-wash is either sent back to the thickener or else to waste. Seldom is the lead froth enriched in a lead cleaner machine and then filtered. However, the cleaning and filtering of the lead froth is a step that will no doubt soon be made throughout the district. Sometimes the second lead machine is employed to make a froth which is returned to the first machine. The pulp passes from the lead machine to the first zinc machine at the head of which reagents for blende are added. The froth from this machine is filtered direct or else it is sent to a small concentrate thickener and thence to the filter. The underflow from the first machine is sent to the second zinc machine, which produces a finished tailing and a froth for return to the first zinc machine.

The flotation feed varies in content from a trace to about 2 per cent lead and from 5 or 6 per cent blende to as much as 25 or 30 per cent. The tailings contain a negligible quantity of lead, less than 0.10 per cent lead, and in blende content they are usually 1.25 per cent and down to very low figures, such as 0.2 or 0.3 per cent blende. The zinc concentrates are usually 54 to 57 per cent zinc and contain seldom more than 1.5 per cent lead; generally the lead content is less than 1.0 per cent. The lead concentrates coming from the tabling of the lead froth are of very good grade, usually in excess of 70 per cent lead. Of course the side-wash from the tabling of the lead froth is a low-grade product, which is often sent to waste. It is a mixture of galena, blende, and mud, and its disposal constitutes one of the problems in Tri-State flotation.

The tonnage of feed to the flotation circuit is from 8 to 10 per cent of the mill tonnage—that is, the average flotation plant treats from twenty-five to thirty-five tons per ten-hour shift. Generally there is a negligible amount of plus 150-mesh material in this circuit. The great bulk of the mineral floated, often 80 to 85 per cent by weight, is finer than 325 mesh. Tri-State mill practice causes all of the mud and slime in the entire ore to be segregated in the flotation plant; no granular material is ground directly for flotation. In a few mills the practice of sending the tailings from the fine-sand tables appears to be of advantage. Often the argument has been made by flotation workers that the presence of granular material is desirable in the flotation of slime. And it is true that the mills following this scheme are usually producing leaner tailings than those which do not. Adding fine-sand tailings to the flotation circuit does not add any 100-mesh mineral, but considerable sand of this size contains mineral of a much finer size. The disadvantage of adding this sand is that the interiors of the machines are worn out more rapidly.

The diaphragm pump for taking care of the thickener discharge is gaining popularity, and aids in getting improved results, as the pulp density, an important factor in flotation, may be more carefully regulated than when the size of the nipple in the discharge was the means of control.

Investigators are today stressing the extreme importance of preliminary conditioning of the pulp. This is entirely different from the emulsifying cells used when oils were employed as the principal reagents. In some fields, conditioning tanks, two or even three in series, are being installed ahead of flotation, particularly where selective flotation is used. The mild agitation in these tanks for a period of from one to thirty minutes permits contact and action of the reagents. Xanthate is a reagent which is understood to undergo a chemical reaction when in contact with the mineral surfaces, and the result is modified surfaces. Usually an interval of time must elapse before a chemical reaction becomes complete. Hence the reason for conditioning tanks is evident.

The reagents used in the field are numerous, and there is scarcely any uniformity as to what reagents are used from day to day. Xanthate is probably most commonly used. Pine oil, cresylic acid, various Barrett oils, X-Y, hardwood creosote, sodium cyanide, sodium carbonate, zinc sulphate, copper sulphate, lime, sulphuric acid, and sodium silicate are some which are in use. The tendency, however, is toward simplicity of reagents and fewness in number. For instance, one company is having quite good success with cresylic acid and xanthate, added sparingly for the flotation of lead, and the same reagents plus copper sulphate are used for the blende.

Quantities of reagents used per ton are very variable. The tonnage of pulp is not determined accurately and the reagents are usually not added in definite quantities. The following figures are approximate ones for a particular flotation plant handling about thirty-five tons per ten-hour shift:

Reagent	Pounds
Xanthate	3
Copper sulphate	35
Sulphuric acid	30
X-Y oil	4
Pine oil	2
No. 22 creosote oil	4

At the present delivered prices of these reagents, the cost is about 17c. per ton of dry pulp treated. At this mill the xanthate, some of the X-Y oil, and some of the pine oil is added in the lead circuit. The remainder of the reagents is employed in the blende flotation. In this instance no xanthate was used in the zinc circuit.

Oftentimes several other reagents are resorted to because of the variable nature of the water. Some of the waters have appreciable quantities of zinc and iron salts dissolved in them. When these soluble constituents are present, flotation is far more difficult, and the results are erratic. Study and preparation of the water constitutes one of the really serious problems in Tri-State flotation. This problem needs careful consideration because the re-treatment of tailing piles, sand piles, and slime ponds is assuming more importance and gradually becoming a reality. Flotation will be a very essential step in this re-treatment plan, and there are more soluble constituents in the water in a re-treatment plant than in mills treating virgin ore.

Both the disk type and the drum type of filters are in widespread use and appear to be giving satisfaction. Occasionally some of the concentrates from the fine-sand tables are filtered with the flotation froth.

The flotation machines in most common use—80 to 85 per cent—are of the horizontal drum type.

People You Should Know About

Charles F. Rand will sail for Germany on June 15.

Sam A. Lewisohn, vice-president and treasurer of the Miami Copper Co., has returned from a vacation trip abroad.

Frederick G. Clapp and the Associated Petroleum Engineers announce the removal of their offices to 50 Church Street, New York City.

L. R. Robbins, superintendent for the Tonopah Belmont Development Co., in Arizona, was recently in Tonopah, Nev., on business for his company.

J. P. Bickell, president, and **Joseph Errington,** a director, of the McIntyre Porcupine Mines, Ltd., are inspecting coal properties held by the company near Banff, Alberta.

William Spence Black, mining engineer of Boston, arrived in New York last week from Trinidad. He has been away for four months on professional work in Dutch Guiana.

James Chamberlain, mining engineer, formerly with the Butte & Superior Mining Co., sailed from New York on May 20 to fill a position with one of the mining companies in Bolivia.

C. M. Weld, of Weld & Liddell, consulting engineers, has just returned to New York from an examination of natural gas property in Oklahoma. He was accompanied by an assistant, **E. B. Burwell.**

H. C. Carlisle, chief engineer for the Tonopah Mining Co., of Nevada, in the Western states, with headquarters in San Francisco, has been in Tonopah and Gold Circle, Nev., where his company is operating.

Dr. E. M. Spieker, assistant professor of geology at Ohio State University, recently addressed the geological society at the University of Cincinnati on problems of Cretaceous stratigraphy and sedimentation.

J. R. Brown, who recently completed the Veta Grande cyanide mill at Zacatecas, is now construction superintendent for the San Francisco Mines of Mexico, Ltd., with headquarters at Santa Barbara, Chihuahua.

Clarence A. Fredell has resigned his position with the A. S. & R. Co. in Angangueo, Michoacan, Mexico, to accept the post of chief engineer with Neg. Minera San Rafael y Anexas, Magdalena, Jalisco, Mexico.

W. E. Simpson, mining engineer, is reopening the old Grace mine, at Michipicoten, Ontario, for the United Algoma Mines, Ltd., of which he is consulting engineer. The property was discovered in 1897, and has been idle for nearly twenty years.

Edward V. Peters has resigned as general sales manager of the New Jersey Zinc Co., effective July 1. His position is being assumed by **A. P. Cobb,** vice-president, who will be assisted by **J. H. Janeway,** assistant to the vice-president.

W. W. Robertson, of Colorado Springs, Colo., has arrived at Pinos Altos to operate the Blooming copper mine. Mr. Robertson operated in this camp many years ago, but has spent the intervening years operating in the Cripple Creek and Leadville camps of Colorado.

F. W. Sperr, head of the mining department of the Michigan College of Mines, at Houghton, for many years, was tendered a banquet by the faculty and a large number of former students of the college on June 5. The date was Professor Sperr's seventieth birthday anniversary.

George J. Young, associate editor of *Engineering and Mining Journal-Press* and Western editor of *Coal Age,* has been visiting Utah coal- and metal-mining camps. From Salt Lake, Mr. Young went to Wyoming to get in touch with conditions prevailing in the coal industry of the Pioneer State.

E. H. T. Plant

S. R. Capps, of the Alaskan Branch of the U. S. Geological Survey, sailed from Seattle on May 29 in charge of a geologic and topographic party that will make surveys in the headwater regions of Skwentna and Kuskokwim rivers. **K. W. Trimble,** topographic engineer, is a member of the party.

Walter A. Schmidt, president and general manager of the Western Precipitation Co., recently left Los Angeles for New York. He stopped en route to inspect the new installation of electrical precipitation soon to go into operation at the plant of the Universal Portland Cement Co. near Duluth, Minn.

George H. Horne, field engineer for the Western Precipitation Co., has sailed from Japan for the United States. He had been in Japan for five months superintending the installation of the electrical precipitation process in the plant of the Asano Portland Cement Co. Mrs. Horne accompanies him on the trip.

E. P. Mathewson recently spent a week at Anaconda and Butte inspecting new appliances at the Washoe smelter and new methods of mining at Butte. While in Montana he was greeted by many old friends and employees and was an active participant at a "clay-pigeon" shoot held at the Rocker range.

Douglas Christopherson, C.B.E., has been elected a vice-president of the Transvaal Chamber of Mines. He came to South Africa in 1892 and, after a few years farming in the Cape Province, went to Rhodesia. He joined the Consolidated Goldfields group in 1899 and has held his present position as resident director since 1913.

John C. Ryan, son of John D. Ryan, chairman of the board of directors of the Anaconda Copper Mining Co., who has been connected with the sales department of the United Metals Selling Co., a subsidiary of Anaconda, is in Butte, Mont., to become assistant to **J. R. Hobbins,** vice-president in charge of the entire Montana operations of the Anaconda company. Mr. Ryan is a graduate mining engineer from the Michigan College of Mines, and for five years he has been connected with various departments of the Anaconda company.

Arthur French, general business manager of the General Mining & Finance Corporation, Ltd., has represented the Albu house on the Transvaal Chamber of Mines since 1914. During eleven years he has on seven occasions held the office of vice-president of the Chamber. On March 29 he was elected president for the coming year. Trained as a chartered accountant in England, he joined the London staff of the Albu group of mines twenty-four years ago. After a few months in London, he was transferred to the Johannesburg office as acting secretary to the group. He became joint manager in 1907 and manager seven years later.

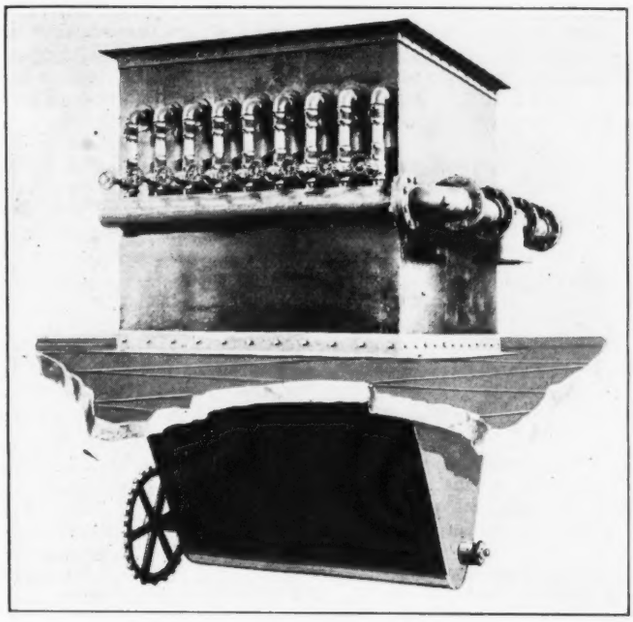
Obituary

Joseph C. Sibley, prominent oil man and ex-Congressman, died at Franklin, Pa., on May 19.

Rawlinson Tennant Bayliss, a widely known and highly esteemed British mining man, died on May 4, in his seventy-first year. Mr. Bayliss first became prominent in the 80's of the last century through his connection with the Montana Mining Co. mines, which he brought to successful production. Later he became interested in the Exploration Co. and in Mexico Mines of El Oro, the El Oro Mining & Ry. Co., and Buena Tierra.

E. H. T. Plant, for many years a prominent mining man in Queensland, Australia, died at Sandgate, near Brisbane, in April last. As pioneer, prospector, mill proprietor, and owner or part owner of what were once some of the most notable gold mines of Queensland, Mr. Plant spent fifty strenuous years in the north of that part of Australia, but in his declining days enjoyed the comforts of a home in the more salubrious climate of the southern seaside resort where his death occurred. He went from England to Australia as a young man, without capital; made his first "rise" by means of a fortunate gold find when prospecting in the central district of Queensland, near where the Mount Morgan mine was afterward discovered, and subsequently acquired a competence as promoter and part owner of some of the richest gold mines of Charters Towers. A biographical sketch of Mr. Plant appeared in *Engineering and Mining Journal-Press* of July 18, 1925.

New Machinery and Inventions



Exterior view of new continuous thickener of filter type. Floor has been cut away to show lower portion of tank

A New Continuous Thickener of the Filter Type

Recently a new thickener of the filter type has been added to its line of metallurgical equipment by the United Filters Corporation, of Hazelton, Pa. The new device is known as the Sweetland thickener. Although primarily designed to meet a special demand in the beet-sugar industry, it is also applicable to practically every problem requiring thickening, according to the manufacturers.

The filtering element of the thickener consists of a round cloth-covered grooved or fluted redwood stick, approximately 40 in. long and 2¾ in. in diameter, which terminates in a casting at the top. A hole is bored down the top of the stick for a few inches, where it is met by radial holes drilled to conduct the filtrate from the outer corrugations to the inner longitudinal hole, to permit egress of the clear filtrate. The construction of the filtering element is shown in the sketch in the accompanying drawing.

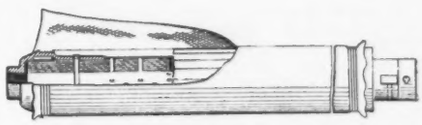
The filter cloth is furnished stitched in tubular form open at both ends. After being slipped over the drainage member the ends are tied. The lug at the bottom is secured by a cross bar to hold the elements in vertical alignment. The net filter area of each element is about 2½ sq.ft. The elements are assembled on headers of steel pipe into which nipples have been welded. One end of the manifold is closed, and the other is provided with a suitable coupling to unite it to the outlet fitting which passes through the side of the tank. In the particular installation considered there were in all 144 of these filtering elements arranged along eighteen headers, each header having eight elements spaced 6⅜ in. center to center along its length. The eighteen headers in turn were spaced on 3 in. centers inside the tank.

The headers are assembled in parallel rows in the steel tanks with their coupling ends alternated, so that every other one connects with the manifold on one side of the tank and the intermediate ones connect with the manifold on the opposite side. Headers and filter elements are all interchangeable, and the arrangement is such that the elements are compactly placed in staggered rows throughout the tank. Each header communicates with its manifold through a sight glass and shut-off valve, so that the outflowing filtrate from each header is visible, and, in case of a leak, may be shut off. Heat-resistant glass of special make is used in the fittings.

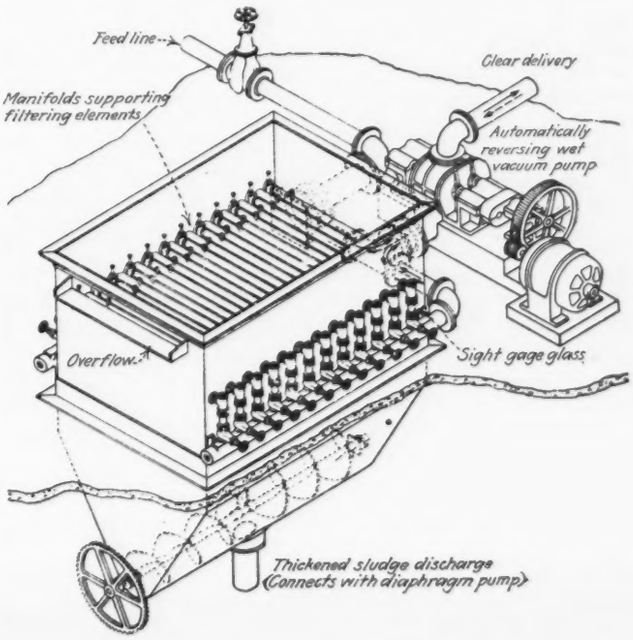
The tank is of riveted steel plate reinforced by the ribs of structural steel. It is built for strength and durability. The upper portion is a rectangular box, and the lower portion an inverted cone. This cone terminates below in a rounded bottom to accommodate the right- and left-hand scroll, which gently propels the thickened sludge toward the outlet flange at the center. The feed pipe is ordinarily placed on the end nearest the point where the two manifolds converge to unite with the pump connection. It should be stated that two manifolds are joined together at the front of the thickener body and connected to a pipe with an automatically controlled motor-driven rotary-type wet vacuum pump used to withdraw the filtrate from the thickener.

An overflow lip at one end of the tank, extending the full width, carries off the surplus feed. This empties into a hopper built into the tank and terminates in a pipe flange at the lowest point. The overflow lip is 17 in. above the top of the headers, giving a static head which, based upon cold water, is equivalent to 1.2 in. of vacuum.

The wet vacuum pump in the installation considered was a standard 6x9-in. belt-driven Connersville two lobe rotary pump, running at 300 r.p.m. This is a reversible type of rotary, capable of producing a partial vacuum on one side, and discharging against a head on the opposite side, depending upon the direction of rotation. The pump is driven by a squirrel-cage type of motor, which is also capable of reversing its direction when its connections are reversed. Reversal of the motor which drives the pump takes place at proper intervals to produce the correct cycle of operation. This is effected by means of a rotary switch mechanism which is actuated by a ¼-hp. motor. The rotat-



Elevation and partial section of thickener filter element



Sketch showing construction of new continuous thickener. Solid arrows indicate flow of clear filtrate. Broken arrows indicate flow when pump is reversed for discharging

Recent Technical Publications

Reviews, Abstracts, and References

The Geology of Aspen, Colo.

Recent Developments in the Aspen District, Colorado. By Adolf Knopf. Bull. 785. U. S. Geological Survey, 1926. Pp. 1-28.

The Aspen district was mapped by J. E. Spurr in 1925, and the results published in U. S. Geological Survey Monograph No. 31. Professor Knopf visited the district in 1923, to investigate mining operations which had extended south of the area originally surveyed. The writer says:

"The public demand for a resurvey of the Aspen district was in essence a strong tribute to the great practical usefulness of the Aspen monograph, by J. E. Spurr. In no other district in the writer's acquaintance has the local geology become so thoroughly part and parcel of the working knowledge of the mining population as at Aspen. 'Cambrian quartzite,' 'Silurian dolomite,' 'Weber shale' are everyday terms among these men, and the stratigraphic and lithologic significance of the terms is fully understood. The accuracy and the detail of the geologic maps accompanying the monograph have made them often do service in determining the exact location of the portals of mining tunnels that were to be driven. Some of these tunnels have been driven along the cross-sections shown in the Aspen monograph and have verified the geologic conditions depicted in the cross-sections. Occasionally long tunnels have been run to intersect ore at depth, as at the Newman tunnel, in defiance of the geologic conditions shown in the cross-sections, and the result has been that much money was unnecessarily expended."

Professor Knopf was able to make some contributions to the knowledge of the igneous rocks of the district. The quartz porphyry of Spurr he divides into three phases, and finds albite the predominating feldspar, not orthoclase. A new variety of igneous intrusive is granodiorite porphyry, which occurs just south of the region mapped by Spurr: this he regards as the youngest igneous rock of the district. Dr. Knopf also divides the glaciation at Aspen into two periods.

The ore-forming solutions Dr. Knopf thinks may be genetically related to the granodiorite porphyry. As to stages of mineralization, Spurr in 1895 recognized three stages in the deep mines near the town of Aspen, the relations of which were more clearly defined in a close study and mapping of the Smuggler mine, made a decade later. In the Smuggler mine and adjacent mines the first stage was barite, in fissure veins, inclosing angular fragments of the country rock. Partly contemporaneous and partly distinctly subsequent to the barite were rich silver minerals, such as polybasite, argentite, tetrahedrite, and tennantite. A slight faulting movement succeeded in the Smuggler mine, and then large quantities of galena and blende were deposited, mainly by replacement of the limestone and dolomite: "the occurrence of angular fragments of barite, frequently containing slightly later silver sulphides, in the heavy breccia which has been cemented by the galena-blende ores, is shown abundantly in many parts of this mine."[1] Weed,[2] subsequent to the publication of the original Aspen monograph, had suggested that the remarkably rich silver ores of this locality were due to "secondary enrichment" by descending surface waters: but the second paper of Spurr showed that they were primary, as had been assumed in the original monograph. Bastin[3] made a microscopic study of some of these ores from specimens in private collections, with little field work, and published his observations in 1924. Bastin wrote[4]:

"According to Spurr, primary ore deposition was limited to a single period, which was brief as contrasted with the duration of faulting. Within this period he recognized three stages, characterized by dominance of different minerals but showing transitions."

Bastin found in the specimens studied two groups of primary minerals: A (early primary), barite and tennantite; B (later primary), galena, blende, pearceite (polybasite), and argentite. In many specimens this division is not discernible. He says[5], "In some places in the rich silver ores tennantite and barite are the oldest primary minerals and are traversed by replacement veinlets of later primary galena, sphalerite, bornite, chalcopyrite, pearceite, and calcite. Elsewhere a division into two groups cannot be made, all the primary minerals having apparently been deposited essentially contemporaneously."

Microscopic study of the Midnight mine, in the newly developed region studied by Dr. Knopf, revealed small crystals of tourmaline in a sulphide ore carrying galena, blende, quartz, barite, and calcite; barite ores, containing barite and polybasite, in another mine, show sericitic alteration of the wall rock. Dr. Knopf is not disposed to divide the ore deposition into three closely following and overlapping stages[6], as done by Spurr; or into two closely following and overlapping stages, as done by Bastin; but is inclined to postulate a single stage only. The field observations of Spurr in the Smuggler-Molly-Gibson section, however, clearly indicated the (overlapping) succession described; and this determination is of economic significance also, as it explains the high localization of the rich silver ores. From the sequence which he noted—barite, silver ores, galena-blende—which is the reverse of the usual sequence (deposited according to the Zonal Theory, under conditions of falling temperature), Spurr reasoned that the Aspen ores were deposited under conditions of rising temperatures[7]. The occurrence of tourmaline, a rather high-temperature mineral, noted by Knopf in the galena-blende ores, would seem to support this conclusion of relatively high final temperatures. J. E. SPURR.

[1] Ore Deposition at Aspen, Colo., *Econ. Geol.*, Vol. IV, June 1, 1909.
[2] *Bull.* Geol. Soc. of Am., Vol. XI, p. 202.
[3] U. S. Geol. Surv., *Bull.* 750-C, 1924.
[4] *Op. cit.*, p. 42.
[5] *Op. cit.*, p. 60.
[6] See also "The Ore Magmas," 1923, p. 357.
[7] *Econ. Geol.*, Vol. IV, June 1, 1909, p. 319. "The Ore Magmas," 1923, p. 288.

Mining and Milling at Ray—*The Mining Congress Journal* for May (Washington, D. C.; price, 30c.) contains several papers on mining and milling copper ores in the Ray district, Arizona, that were read at the recent meeting of the American Mining Congress at Ray and Hayden. These include: "Mining Methods Being Used at Ray Mines," by Robert W. Thomas, pp. 3; "Remodeled Flow Sheet at Hayden Plant," by Walter I. Garms, pp. 2; "Pneumatic Placing of Concrete at Ray," by Cyril A. Robotham, pp. 2; and "Water Development for the Hayden Plant," by Nels Johnson, pp. 5.

Concentration of Graphite — "The Concentration of Flake Graphite" is discussed by C. S. Parsons in an 11-page mimeographed bulletin, Memorandum Series No. 25, obtainable on request from the Department of Mines, Ottawa, Canada. The paper tells how to test graphite ores, suggests flow sheets, and describes the types of machinery that have been found to give the best results. The massive crystalline variety of graphite is not considered.

Analysis of Uranium Ores—"The Volumetric Determination of Uranium, Vanadium, Copper, and Iron in Uranium Ores" is discussed by A. S. Russell in *Chemistry and Industry* for March 12, pp. 3. (Society of Chemical Industry, Central House, 46 and 47, Finsbury Square, London, E. C. 2, England; price 1s. 9 d.) The process outlined is said to be an improvement on the process discussed in Bulletin 212 of the U. S. Bureau of Mines.

The Explosives Engineer—With the May issue, *The Explosives Engineer*, published at Wilmington, Del., by the Hercules Powder Co., goes on a subscription basis, the price of each issue being 15c., or three years for $1. In this issue is a short article on "Blasting Hot Ore With Black Powder," by W. R. Ellis, describing work at Jerome, and another brief article by F. W. Hotchkiss on "Ventilating Mines With Flexible Tubing."

Dust Respirators—The U. S. Bureau of Mines, Washington, D. C., has issued an 8-page bulletin on "Tests and Characteristics of Dust Respirators," by S. H. Katz, G. W. Smith, and E. G. Meiter. Laboratory investigations on commercial types of respirators are summarized, a more complete report to be issued later. The paper may be obtained on request for *Reports of Investigations* No. 2,745.

Flotation of Limestone—Limestone is not ordinarily thought of as a mineral that is amenable to the flotation process, but some favorable results have been secured on a laboratory scale at the Tuscaloosa (Ala.) station of the U. S. Bureau of Mines. These are briefly summarized in *Reports of Investigations*, No. 2,744, of the U. S. Bureau of Mines, Washington, D. C., pp. 3, obtainable on request. The report is entitled "Flotation of Limestone From Siliceous Gangue," and has been prepared by Oscar Lee.

The Market Report

Metal Markets Liven Perceptibly

Large Volume of Business, With Better Prices for Copper and Zinc

New York, June 9, 1926—After a period of comparative dullness, the non-ferrous metal markets have come to life. Consumers who have been holding off appear at last to have reached the point where they must buy for early requirements. London has shown strength during the week, and, with sellers in the domestic market stiffening their prices, the buying movement was accelerated. Both copper and zinc are quotable at higher figures than a week ago, and although there is little change in lead the position is stronger. A large part of the buying of lead and copper has been for June and early July, thereby indicating how bare of raw material manufacturers are.

Daily Prices of Metals

June	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
3	13.55	57.25	59.50	7.65	7.45@7.50	6.95@7.00
4	13.575	56.875	58.75	7.65	7.475	7.00
5	13.575	56.875	58.75	7.65	7.475	7.00
7	13.575	56.75	58.50	7.65	7.475@7.50	7.00
8	13.60	57.00	58.75	7.675	7.475@7.50	7.025@7.075
9	13.65	57.75	59.375	7.675	7.525	7.075@7.10
Av.	13.588	57.083	58.938	7.658	7.488	7.019

The prices correspond to the following quotations for copper delivered: June 3rd, 13.80c.; 4th, 5th and 7th, 13.825c.; 8th, 13.85c.; and 9th, 13.90c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
3	56 1/8	57	64	263 3/4	262 3/4	29 7/16	29 3/8	32 1/2	32 7/8
4	56 1/8	57	64	262	260 1/2	29 1/4	29 7/16	32 1/2	32 7/8
7	56 1/8	57	64	261 1/2	259 7/8	29	29 5/16	32 5/8	33
8	56 1/4	57 1/8	64 1/4	261 5/8	260 1/2	29 5/16	29 9/16	32 15/16	33 5/16
9	56 3/8	57 1/2	64 1/2	265 3/4	264 1/2	29 3/8	30	33 1/4	33 1/2

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June	Sterling Exchange "Checks"	Silver		Gold London	June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
3	4.85 3/4	65 1/8	30 1/16	84s11 1/2d	7	4.86	65 1/4	30 3/16	84s11 1/2d
4	4.85 7/8	65 1/4	30 1/16	84s11 1/2d	8	4.86	65 1/4	30 1/8	84s10 1/4d
5	4.86	65 1/4	30 1/8	.....	9	4.85 15/16	65 1/4	30 3/16	84s11 1/2d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Copper at 13.875c. in the East

Until noon Tuesday 13.80c., delivered in the East, with a variety of figures ranging to 14.00c. for Mid-West points, was the prevailing price for copper. Though some sellers were holding at 13.875c. yesterday, 13.80c. was obtainable in at least two directions in the morning. Since then no business has been reported at less than 13.85c., and the preponderant tonnage has brought 13.875c. for Eastern delivery. A good business in the foreign market is also reported, as much as 13.80c. and 13.85c. f.a.s. being obtainable today. Several of the important producers have disposed of their allotment for June and into July, and the outlook seems good from a producers' standpoint.

Lead Active All Week

Though prices of lead in the domestic market have changed but little since last week, buying has been active and sentiment continues to improve. London has advanced, so that present prices there are the highest for two months, and it is now more profitable to sell foreign ore lead abroad rather than pay the duty of 1½c. and sell it in the United States. As this country has shown a capacity to absorb all of this for some months, it would seem that unless the advance in London is arrested higher prices here are in order. Stocks do not amount to anything, and at least one of the large producers is not a free seller.

St. Louis prices have, in general, varied between 7.475 and 7.525c. all week, with 7.575@7.60c. realized in Chicago. The volume of sales has been excellent and they have been well distributed. In the East, the American Smelting & Refining Co. continues to quote its contract price on New York lead at 7.65c., but some consumers complain of difficulty in getting the metal at that level, and some lots, even for July shipment, have brought up to 7.85c.

Zinc Buying Active

The week has been an exceptionally active one in zinc. Galvanizers, who have not been large buyers recently, have come into the market, and their buying has made prices firmer. Improved conditions in Germany have diverted Continental smelter production away from Britain, and this helped the London market. Today's price is 7.10c., though activity has slackened. High-grade is held at 8.25c. delivered in New York.

Lower Tin Prices Attract Buyers

The lower prices quoted on tin in London, and reflected in the domestic market, have resulted in a moderately active market all week. There has been considerable covering by short interests, and also good consumer buying

ing elements of this mechanism are back-geared to make one revolution for each cycle of operation.

The thickened material or sludge is removed by connecting a diaphragm pump to the flange at the center of the bottom of the tank. This pump is usually located at a level adjacent to the level of the liquid in the tank, and its capacity is made adjustable by varying the speed or stroke of the pump, or otherwise. Thus the density of the thickened material may be varied at will simply by varying the rate of withdrawal.

If preferred, the diaphragm pumps may be eliminated and the thickened product may be discharged through a pipe which connects with the bottom flange and terminates in a valve located alongside the tank and about midway between the liquor level and the tank bottom. If this method of discharge is used the density and rate of discharge are regulated by the valves.

Electric Heater Makes Sand Flow Freely from Pipe

In order to eliminate the uncertainty and danger incident to clogging of a locomotive's sand pipe from water or freezing, the Crawford Machinery Co., Bessemer Building, Pittsburgh, Pa., is marketing the safety electric sander shown in the accompanying illustration. This simple device assures a dry and unobstructed end on the sanding pipe and a dependable flow of sand at all times.

As is well known, dry sand will not flow from the end of a wet pipe without some of it sticking to the interior surface. This decreases the effective delivery area, and if it becomes cumulative, as is frequently the case, the entire cross-section of the pipe may be effectively clogged. Many accidents and much delay to traffic have occurred on railroads, street-car lines and on mine and industrial roads generally from this cause.

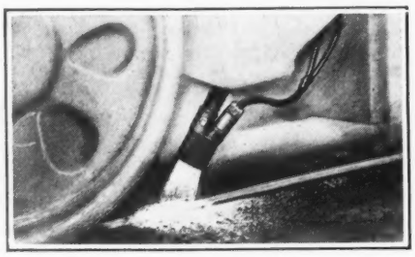
Electric Heating Averts Clogging

After long study and experimentation, a railroad locomotive engineer who, during his 32 years of active service, encountered many difficult trips, because of the clogging or freezing of the sand pipe on the engine, devised the equipment here shown. In construction this device is extremely simple. It may be attached to the end of the sand pipe nearest the rail and is heated electrically. By this means it is possible to drive moisture out of the pipe, keep it out, and positively avoid clogging.

This electric sander is fastened to the lower end of the sand pipe next to the rail. If rubber hose is used at this point it is removed and the pipe extended so as to permit proper attachment. The sleeve of the sander is slipped over the end of the pipe and made fast by heavy set screws and lock nuts.

The necessary wire connections to any convenient source of electrical supply are easily made and are readily accessible for inspection. The function of the device is to keep the delivery orifice dry, and thus to permit of a flow of sand, thereby assuring adequate traction and maximum adhesion for braking whenever this is needed.

Should the end of the sand pipe be submerged in water, the sander will immediately respond as soon as the device rises above the surface of the liquid. The heat generated by the passage of current is sufficient to dry



Sander with electric heater in operation

the end of the pipe in a few seconds. It is thus positively effective in operation, and may be applied to any sand pipe on any type of locomotive or street car.

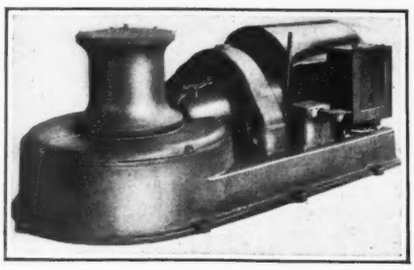
Mine locomotives thus equipped are able to handle trips on heavy grades with greater efficiency and with perfect confidence on the part of the motorman, as moisture in the mines or water through which the machine may be compelled to pass will not in any manner clog the sand pipe.

Many motormen have been badly injured and some have been killed in trying to release sand from clogged pipes while the trip was running away on a heavy grade. As a rule the motorman has no recourse when he is unable to release sand on a wet or slippery rail.

Electric Capstan Pulls Cars

In the accompanying illustration may be seen the improved electric capstan car puller designed and manufactured by the Clyde Iron Works, of Duluth, Minn. In this machine a vertical winch head, or capstan, is bolted direct to a rugged bevel gear which is driven by an electric motor through two sets of intermediate gears and a bevel pinion.

The unit is said to be of exceptionally sturdy construction, having all parts totally inclosed and covered with a semi-steel housing so as to be dust-



and weatherproof. This is a valuable detail of construction, as a car puller is exposed to the elements at all seasons of the year. The capstan head is fitted with renewable bronze bushings.

All the gears are of steel, except the intermediate gear, which is semi-steel, and the motor pinion, which is of Bakelite Micarta, making operation practically noiseless. The frame is so constructed that all gears run in a bath of oil, insuring perfect lubrication. An Alemite greasing system is provided throughout. A hand-operated pawl for holding the load when the capstan is stationary also is furnished. The operation is controlled by a push button arranged for foot control. Over-load and low-voltage protection is provided.

These car pullers are built in three sizes, having line pulls of 3,000, 6,000 and 10,000 lb. at a speed of approximately 40 ft. per minute. They are equipped with 5-, 10-, and 15-hp. motors respectively for the available current.

Trade Catalogs

Blowers—Bulletin 21B of the Connersville Blower Co., Connersville, Ind., covers Victor rotary positive blowers for both pressure and vacuum work.

Meters—The Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, has issued a 56-page catalog, No. E-33, entitled "Steam Economy." In it is discussed how economy in the production and distribution of steam may be effected by the centralized control made possible through the use of meters and the various types of recording instruments made by the company.

Meters — The Bristol Company, Waterbury, Conn., has issued a new catalog, No. 1700, covering its lines of tachometers for recording and indicating.

Water Softener—Bulletin No. 509 of the Graver Corporation, East Chicago, Ind., describes the Graver zeolite water softener. This softener uses the downflow method of softening with a natural zeolite mineral supported by a strainer plate. The bulletin is well illustrated.

Welding—The Chicago Steel & Wire Co., 103d St. and Torrence Ave., Chicago, Ill., manufacturers of Weldite welding rods, have issued a 24-page pamphlet entitled "Effect of Surface Materials on Steel Welding Rods." An effort has been made to make this little book educational throughout.

Engines, Generators—Engberg's Electric and Mechanical Works, 265 Vine St., St. Joseph, Mich., has issued a pamphlet of horsepower tables for Engberg vertical inclosed self-oiling engines. This is intended as a supplement to Catalog No. 602.

Engines—The Climax Engineering Co., of Clinton, Iowa, has issued three bulletins, E. F. and G, respectively, covering Climax gasoline power units. Bulletin E confines itself to units of the portable and stationary types; bulletin F treats of electric generators, a.c. and d.c., 20 to 70 kw., direct-connected to Climax engines; bulletin G covers centrifugal pumps similarly driven.

Diesel Engines—De La Vergne Machine Co., 947 East 138th St., New York, has issued a little pamphlet entitled "The Relation of Power Costs to Profits." The saving effected through the use of oil engines is set forth.

Heating Units—Bulletin GEA-380 of the General Electric Co., Schenectady, N. Y., covers G-E helical sheath wire units.

for future requirements. Forward metal has sold as low as 57½c. The premium on early deliveries is again reduced, the differential today between prompt and September being only about ¾c., prompt Straits being quoted at 59½c.

Silver Quiet and Steady

China is a moderate buyer of silver in this market for San Francisco delivery, but reports from London indicate that sales as well as purchases have been executed for that country's account. India continues to support the market, but only at close prices, and is placing orders through London as well as locally. The market appears quiet and steady.

Mexican Dollars (Old Mexican pesos) June 3d and 4th, 49¼c.; 5th, 7th, 8th, and 9th, 50c.

Francs Again Below 3c.

Francs again broke below 3c. in the week ending today. Closing cable quotations on Tuesday, June 8, were as follows: francs, 3.025c.; lire, 3.71c.; and marks, 23.81c. Canadian dollars, ⅛ per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, 98 per cent, £118 per long ton. Slackness on Continent adverse factor.

Antimony—Per pound, duty paid, New York; Chinese brands, spot, 9½@10¾c. July arrival, 9½@10¾c. Cookson's "C" grade, spot, 20c. Market very dull and prices mostly nominal. Sporadic buying by consumers.

Bismuth—$2.70@$2.75 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. Market good. **London, 1s. 9d. for Australian metal.**

Iridium — $160@$170 per oz. for **98@99 per cent. Nominal. London,** £63@£65 for 99.5 per cent.

Nickel—Ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent). London, £170@£175 per long ton.

Osmium—$80@$85 per ounce, nominal; London, £17@£20.

Palladium—Refined, **$67@$69 per oz. Crude, $60@$65 per oz. London,** £12@£15, nominal.

Platinum — Per ounce refined, officially quoted: $108. Sales also at $104 @$105. Crude, $102@$103. London, £22@£23½ for refined; crude £21.

Reports are current that the official price of refined platinum is to be raised to $110.

Quicksilver—Per 75-lb. flask holding steady at $91.25. San Francisco, $90.83. London, £12@£15.

Ruthenium — $55@$65 per ounce; London, £15@£15½.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Radium, Rhodium, Selenium, Tantalum, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of June 5.

Metallic Ores

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.50@$10.60: Western scheelite, $10.75@$10.85. Little consuming or speculative demand, and prices largely nominal.

Vanadium Ore—Containing 4 to 8 per cent V_2O_5, 30@35c. per pound of V_2O_5 f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 60@65c. per pound V_2O_5, duty paid, seaboard.

Chrome Ore, Iron Ore, Manganese Ore, Molybdenum, Tantalum, and **Uranium** are unchanged from quotations in the June 5 issue.

Prices Advanced on Zinc Blende and Lead Ore

Joplin, Mo., June 5, 1926

Blende	Ton
High	$48.80
Premium blende, basis 60 per cent zinc	$47.00@48.00
Prime Western, basis 60 per cent zinc	46.00
Fines and slimes, 60 per cent zinc	$45.00@43.00
Average settling price, all zinc	45.13
Galena	
High	$95.70
Basis 80 per cent lead	$90.00@92.50
Average settling price, all lead	94.40

Shipments for the week: Blende, 10,970; lead, 1,949 tons. Value, all ores the week, $679,140.

Prices on all grades of zinc concentrates have been advanced $1 per ton, several smelters needing a larger quota of supply than could be obtained on the lower level.

Figures of the Tri-State Zinc and Lead Ore Producers' Association show the cost of a ton of zinc concentrate in April was $45.26, as against $44.03 per ton in March, the high cost to be attributed to loss in recovery, charged to lowered efficiency of labor.

Buyers report and insist that but $90 basis for lead is being paid, but sellers assert that they have sold on $92.50 basis, and it is known that at least one settlement was made on a basis of $92.50 per ton.

Platteville, Wis., June 5, 1926

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$47.50
Lead Ore	
Lead, basis 80 per cent lead	$92.50

Shipments for the week: Blende, 1,056 tons; lead, 80 tons. Shipments for the year: Blende, 22,993; lead, 632 tons. Shipments for the week to separating plants 2,085 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the June 5 issue.

Mineral Products

Arsenious Oxide (White arsenic)— 3½c. per lb. Small lots sold. London, £15 per long ton.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from prices in the June 5 issue.

Ferro-Alloys

Ferromanganese — Domestic, 78@82 per cent, $88@$99 per gross ton furnace; prompt and future.

Ferrosilicon—14 to 16 per cent, $42 @$47 per gross ton, f.o.b. works; 50 per cent, $87.50 delivered in carload lots; 75 per cent, $145. Market active.

Ferrotungsten — $1.05@$1.10 per pound contained W, f.o.b. works according to grade.

Ferrocerium, Ferrochrome, Ferrophosphorus, Ferrotitanium, Ferrouranium, Ferrovanadium, and **Spiegeleisen** are unchanged from prices in the June 5 issue.

Metal Products

Rolled Copper — Sheets, 22½c.; wire, base price, 16c. per lb.

Zinc Sheets — 11.25c. per lb., f.o.b. works.

Lead Sheets, Nickel Silver, and **Yellow Metal** are unchanged from prices in the June 5 issue.

Refractories

Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and **Zirkite** are unchanged from prices in the June 5 issue.

Steel Production and Prices Steady—Pig Iron and Coke Weak

Pittsburgh, June 8, 1926

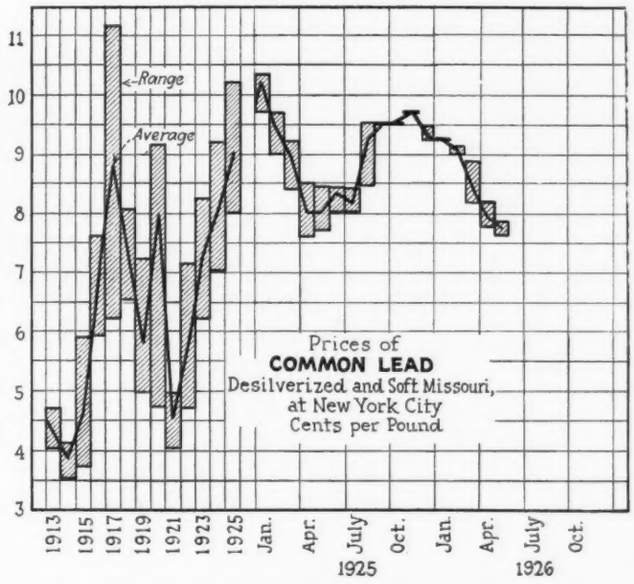
The steel mills continue to operate at an average of fully 80 per cent. In the first three months of this year production and shipments were slightly above those in the first three months of last year; in April and May the gain over a year ago was quite large. The difference is due partly to stocks not having accumulated in buyers' hands this year as they did in 1925, which is all the more remarkable considering the lateness of spring this year. Steel demand is now showing a good momentum, and the prospect is that there will be little further decrease in buying and production this month and next.

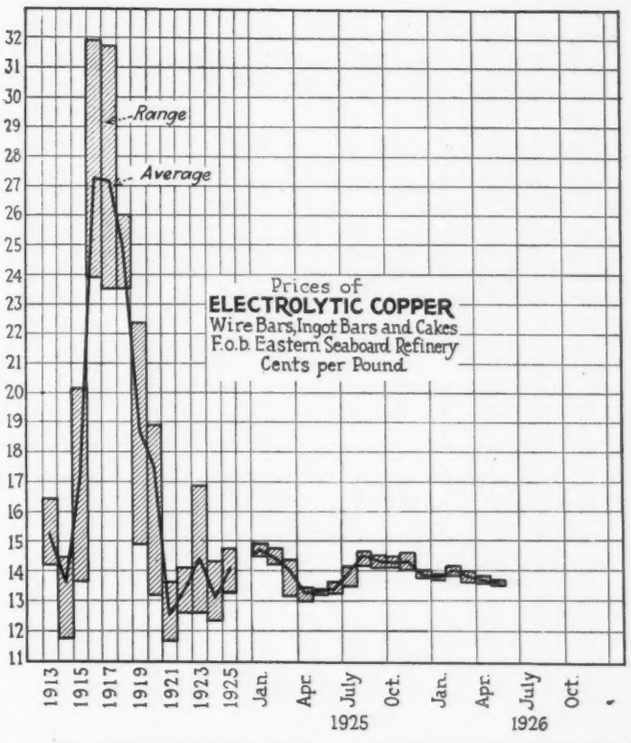
Steel prices are holding moderately well, but the situation is by no means satisfactory to the mills, particularly when possible results of decreased demand are considered. The recent advance of $2 a ton in asking prices of merchant bars is not fully established in the market, although hopes are entertained, and if there is success a similar attempt will be made with shapes and plates. Sheets have had another week of softening, being now at 3.10c. to 3.15c. for black, 2.30c. to 2.40c. for blue annealed, 4.30c. to 4.40c. for galvanized and 4.20c. to 4.30c. for automobile sheets, thus averaging less than $2 a ton above the low level of last summer and early fall.

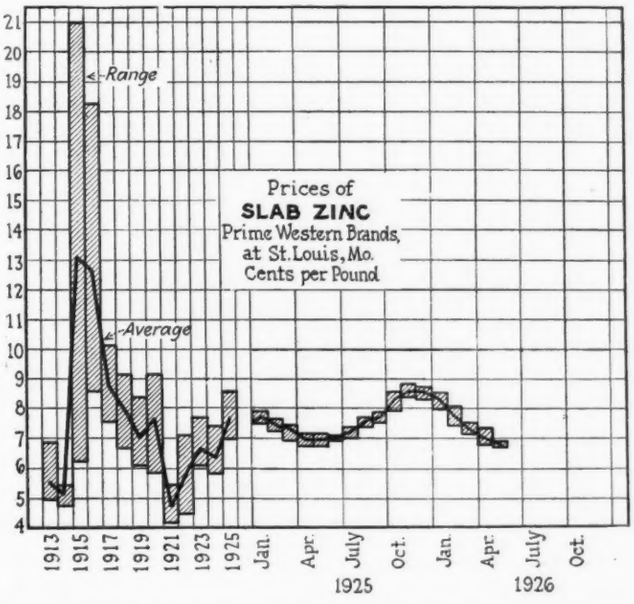
Pig Iron—The Valley pig-iron market has dropped again. Prices were practically nominal for several weeks, when an actual level was made for foundry iron by the Standard Sanitary Manufacturing Co. buying 25,000 to 30,000 tons for second half at $18, Valley. Bessemer is $19 and basic $18.

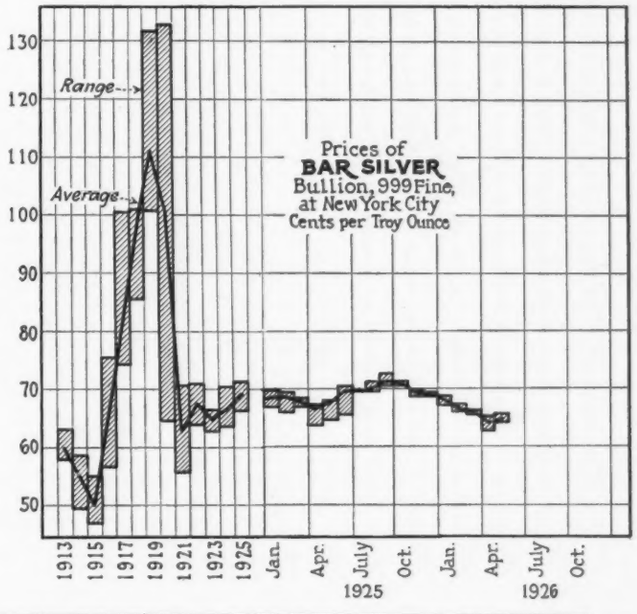
Connellsville Coke—Spot furnace is off 10c. at $2.75@$2.90, foundry remaining at $4@$4.50 for strictly standard.

Metal Price Curves

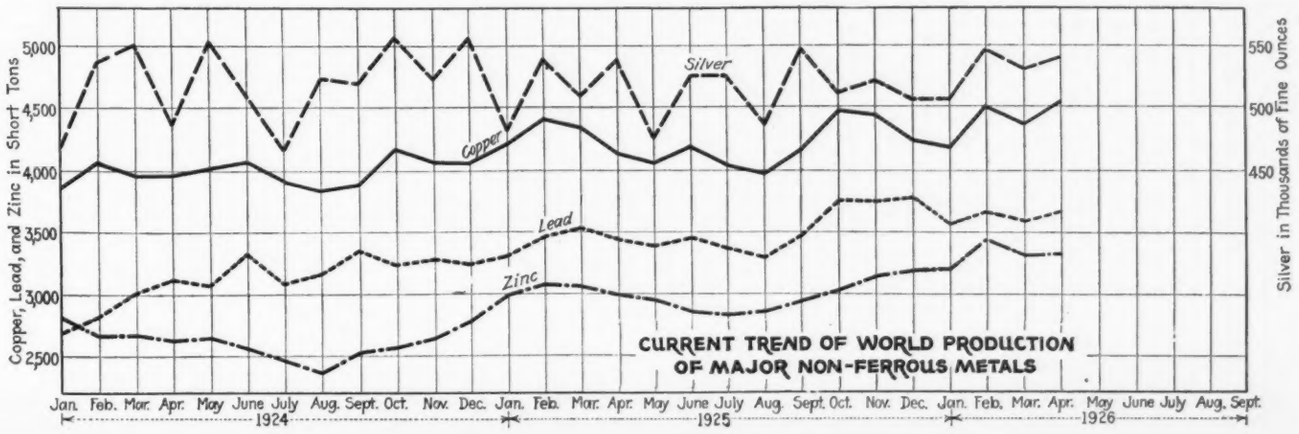



Range
Average
Prices of
ELECTROLYTIC COPPER
Wire Bars, Ingot Bars and Cakes
F.o.b. Eastern Seaboard Refinery
Cents per Pound
1913 1915 1917 1919 1921 1923 1925 Jan. Apr. July Oct. Jan. Apr. July Oct.
1925 1926





THE curves below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output, according to latest estimates of the American Bureau of Metal Statistics. The figures represent countries that produced in 1924 and 1925 about 97 per cent of the world's output of copper; 78 per cent of the lead; 87.5 per cent of the zinc; and 81 per cent of the silver.


Copper, Lead, and Zinc in Short Tons
Silver in Thousands of Fine Ounces
Silver
Copper
Lead
Zinc
CURRENT TREND OF WORLD PRODUCTION
OF MAJOR NON-FERROUS METALS
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept.
1924 1925 1926

Review of Current Statistics

Non-Ferrous Metal Price Index Declines Fractionally—Average for Four Months in 1926 Higher than General Commodity Level—New High Rate of Copper Production

By Arthur B. Parsons
Assistant Editor

SUCCESSIVE DECLINES in the weighted index of non-ferrous metals during the first four months of 1926 paralleled corresponding declines in 1925. In that year, however, as shown on the graph on the opposite page, May marked the starting of a strong upward movement that culminated in December. This year, on the other hand, May shows a continuation of the downward trend. Is this merely a temporary deferring of an upward swing during the second half of the year; or is there to be no decided improvement in the immediate future? Or may there be still further declines ahead? It is generally conceded that industrial conditions, by and large, are not as encouraging as they were a year ago.

Silver and Tin Up

The recession last month would have been greater than it was had it not been for somewhat better figures for silver and tin, which in part offset declines in the more significant metals: copper, lead, and zinc. The net decline was only 0.50, from 105.93 to 105.43. The index for May, 1925, was 105.34, virtually the same as for the same month in 1926, but the changes in the prices of the individual metals is considerable: Copper, tin, and nickel are at materially higher levels, whereas lead, silver, and zinc are lower. Aluminum, too, is quoted at a cent less than a year ago. If lead had averaged 8c. in May instead of 7.751c., the index number curve would have established an upward trend.

Sight should not be lost of the fact that the general price level has declined materially during the last year. The average of the Bureau of Labor's commodity index numbers for the first four months of 1925 was 159.45. For the corresponding period in the current year it was 153.4. If the *E. & M. J.* non-ferrous metal index numbers for each of these four-month periods be averaged and the figure for 1926 adjusted to allow for the decline in the general index number the following comparison is obtained:

Adjusted Metal Price Index

Four months 1925	110.03
Four months 1926	113.20

The Bureau of Labor figure for last month is not yet available, so that a calculation to compare the two metal indices for May cannot be made, but it is quite certain that the advantage lies with the month just passed. Obviously, this is a situation that lends some comfort to the producer of metals.

In the index for non-metallic minerals virtually no change is apparent. Magnesite is not quite so strong, but feldspar producers have obtained a little more for their product than in April. The other "ores" have remained unchanged. Compared with May, 1925, phosphate, asbestos, and borax are up materially, talc and fuller's earth are slightly higher, whereas fluorspar, barytes, feldspar, and magnesite are bringing less than they were. The fact that the commodity weights of phosphate and asbestos are the two highest in the list accounts for the outstanding increase in the index during the last year.

Anaconda, with a drop of 2½ points in its 3,000,000 shares, is the principal factor in the decline of the index for mining-smelting-manufacturing shares, abetted by A. S. & R., United States Smelting, and American Metal. International Nickel and National Lead made good gains. With the single exception of National Lead, all of the shares in this group are selling at considerably higher figures than a year ago, and all but New Jersey Zinc are lower than they were at the peak of December, 1925.

E.&M.J. Weighted Index of Non-Ferrous Metal Prices

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	134.38
Average Five Months, 1925	110.03
Average Five Months, 1926	108.98
April, 1925	104.75
April, 1926	105.93
May, 1925	105.34
MAY, 1926	105.43

"Coppers" Stick Together

Without a single exception the thirteen "coppers" are off a little from last month, Inspiration, Chile, Calumet & Arizona, and Magma being the most important factors. However, the general decline is in accord with the view that individual strength or weakness is of minor importance compared with the tendency of the whole list of representative copper stocks to move along together, usually reflecting the status of the copper market at the moment. These stocks stick together like a flock of sheep.

The different situation obtaining in the third group is illustrated by the fact that of the thirteen, seven receded, whereas six advanced, during May. The declines included Homestake and Cresson, whereas Hollinger and Lake Shore each showed a material rise. All four are strictly gold producers. And with corresponding independence Hecla, Utah-Apex, and Federal went down, while Tintic Standard, Silver King Coalition, and St. Joe went up. These all are silver-lead or lead producers. Federal Common took a deep plunge on the announcement of the court decision adverse to the payment of dividends, but recovered a part of the lost ground. There are only 60,000 shares of the stock outstanding, however, and the influence on the index number is not great.

Hollinger, Canada's famous gold producer, reached $19.25 at the end of May, making a new high record, and incidentally fixing a stock-market valuation of nearly $95,000,000 on the outstanding shares. The only shares in the group that are lower than they were a year ago are Premier and Cresson, both precious-metal mines, and St. Joseph Lead. Outstanding changes during the year are found in Howe Sound—which is more prosperous as a silver-lead producer in Mexico than as a copper producer in British Columbia—and Lake Shore, in Ontario. Each has doubled in share value.

Decline in Domestic Deliveries

Among the significant facts revealed by the curves of production and stocks are: The increase in stocks of copper and zinc as of May 1 compared with April 1 and of lead for the preceding month, the last reported; the increase in the world's production rate of each of the metals, including silver, during April, as appears on the graph at the bottom of page 989; and the sharp drop in domestic deliveries of both copper and zinc. Stocks of zinc and lead are higher than at any time during the last two years.

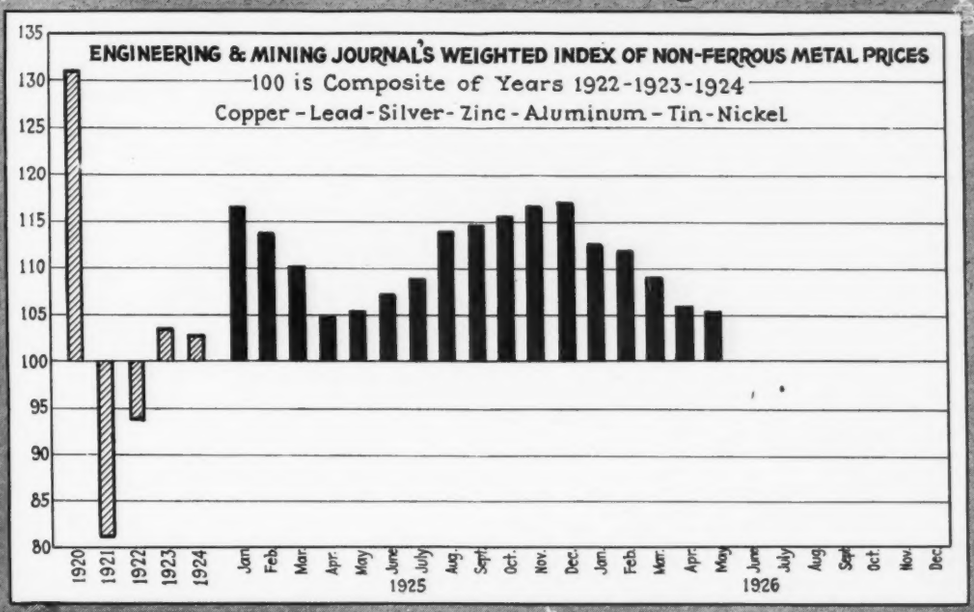
All of these figures for production and shipments are reduced to a basis of daily average, so the shortness of the month is not a factor. How much importance should be attached to the contraction in the volume of domestic deliveries is a matter of opinion. In the case of copper, March shipments were at an exceptionally high rate, so that unless the May figures show a further drop the decline in April need not be a matter for serious apprehension.

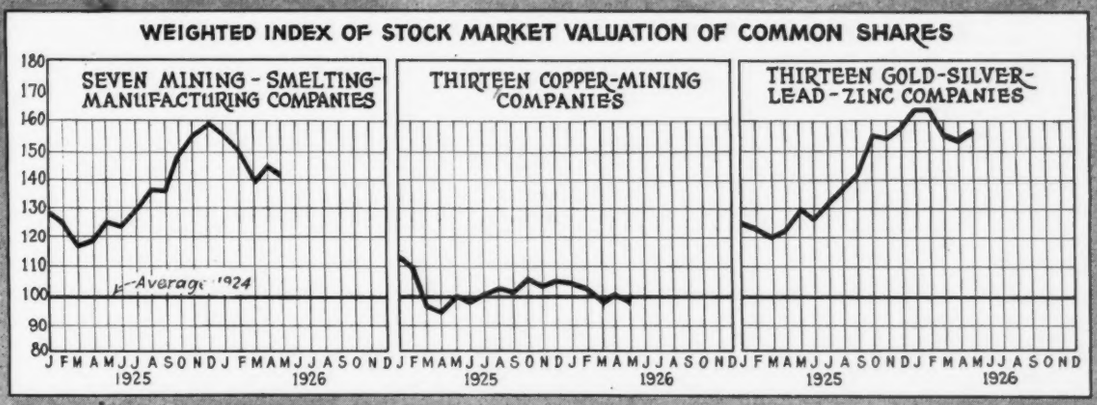
Increase in Copper Output

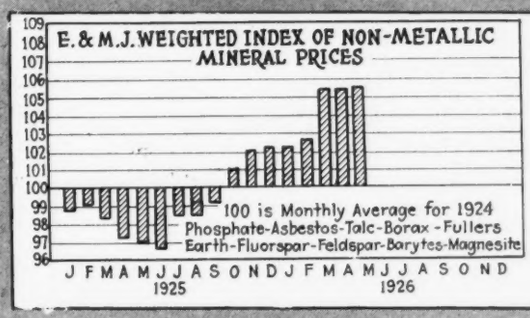
On the other hand, a new record for all time in the world's rate of copper production was established in April: 4,564 tons, or 9,128,000 lb., per day. This is the equivalent of 3,331,700,000 lb. per year, compared with a production in 1925 amounting to 3,175,000,000 lb. The big increase in April was from the United States. Chile and Peru contributed somewhat less and the other countries showed little change.

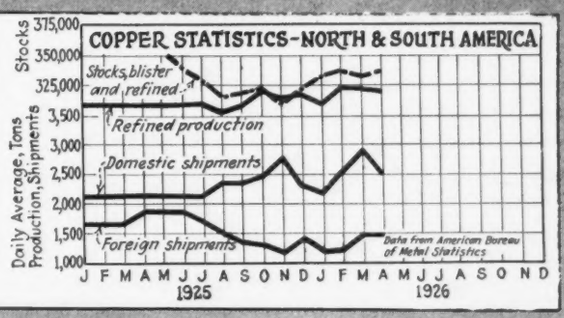
A glance at the price curves on page 989 showing the separate metals discloses the fact that the monthly average prices for May of both lead and zinc are the lowest reached since January, 1925. Further delving into the records shows that one must go back to November, 1924, and August, 1924, respectively, to find lower averages for zinc and lead.

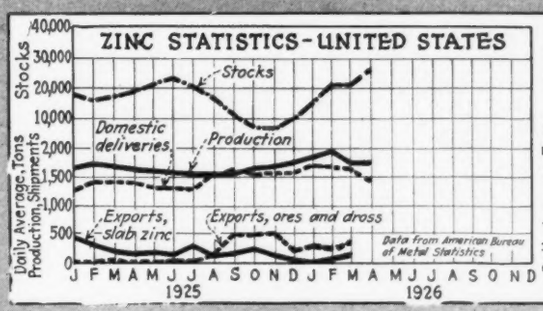
E.&M.J. Statistics of the Mining Industries

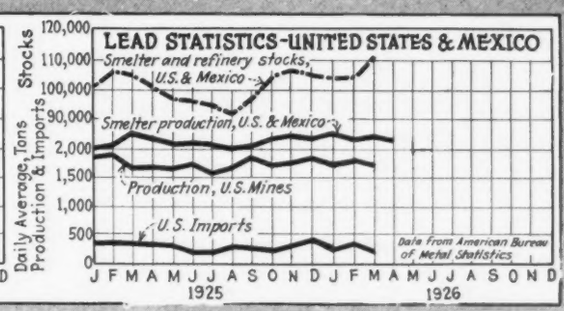

ENGINEERING & MINING JOURNAL'S WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is Composite of Years 1922-1923-1924
Copper - Lead - Silver - Zinc - Aluminum - Tin - Nickel
1920 1921 1922 1923 1924 Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1925
1926


WEIGHTED INDEX OF STOCK MARKET VALUATION OF COMMON SHARES
SEVEN MINING - SMELTING-MANUFACTURING COMPANIES
Average 1924
THIRTEEN COPPER-MINING COMPANIES
THIRTEEN GOLD-SILVER-LEAD - ZINC COMPANIES
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926


E. & M.J. WEIGHTED INDEX OF NON-METALLIC MINERAL PRICES
100 is Monthly Average for 1924
Phosphate-Asbestos-Talc-Borax - Fullers Earth-Fluorspar-Feldspar-Barytes-Magnesite
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926


COPPER STATISTICS - NORTH & SOUTH AMERICA
Stocks
Daily Average, Tons Production, Shipments
Stocks, blister and refined
Refined production
Domestic shipments
Foreign shipments
Data from American Bureau of Metal Statistics
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926


ZINC STATISTICS - UNITED STATES
Stocks
Daily Average, Tons Production, Shipments
Stocks
Domestic deliveries
Production
Exports, slab zinc
Exports, ores and dross
Data from American Bureau of Metal Statistics
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926


LEAD STATISTICS - UNITED STATES & MEXICO
Stocks
Daily Average, Tons Production & Imports
Smelter and refinery stocks, U.S. & Mexico
Smelter production, U.S. & Mexico
Production, U.S. Mines
U.S. Imports
Data from American Bureau of Metal Statistics
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926

Mining Stocks—Week Ended June 5, 1926

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	46½	45	46	Ap.17, My.24	0.75
Arcadian Consol.	Boston	....	....	*75		
Ariz. Com'l.	Boston	9⅜	9¼	9¼	Jy.21, Jy. 31 SA	0.50
Calaveras	N. Y. Curb	1⅜	1⅜	1⅜		
Calumet & Arizona	New York	62½	60⅝	60½	Jn. 4, Jn. 21 Q	1.50
Calumet & Hecla	Boston	14⅜	13⅜	13⅜	Jn. 1, Jn. 15 Q	0.50
Cerro de Pasco	New York	65	62⅜	64⅜	Ap. 15, My. 1, Q	1.00
Chile Copper	New York	32⅞	32	32½	Jn.2,Jn.28, Q	0.62½
Chino	New York	....	....	20½	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	2⅛	2⅛	2⅛		
Copper Range	Boston	14⅛	13¾	14	May, 1925	1.00
Crystal Copper	Boston Curb	*35	*31	*33		
East Butte	Boston	2⅛	2⅛	2⅛	Dec., 1919	0.50
First National	Boston Curb	*17	*16	*16	Feb., 1919	0.15
Franklin	Boston	....	....	*40		
Granby Consol.	New York	19⅛	18	19½	May, 1919	1.25
Greene-Cananea	New York	11¼	10½	11¼	Nov., 1920	0.50
Hancock	Boston	....	....	*50		
Howe Sound	New York	33⅞	33⅜	33⅜	Ap.1, Ap.15	0.75
Inspiration Consl.	New York	23⅛	22⅜	23⅛	Jn.7, Jy.6, Q	0.50
Iron Cap	Boston Curb	3⅜	3⅜	3⅜	Jn. 1, Jn. 15	0.50
Isle Royale	Boston	10¼	10	10	Jn. 1, Jn. 15	0.50
Jerome Verde Dev.	N. Y. Curb	*67	*51	*67		
Kennecott	New York	54⅛	52⅛	52⅛	Jn. 4, July 1 Q	1.00
Lake Copper	Boston	1	*75	1	June, 1925	0.50
Magma Copper	New York	37½	37	37⅛	Mh.31,Ap.15,Q	0.75
Mason Valley	N. Y. Curb	1⅜	1⅛	1⅜		
Mass Consolidated	Boston	....	....	*25	Nov., 1917	1.00
Miami Copper	New York	12⅛	11⅛	12⅛	My.1, My.15Q	0.25
Mohawk	Boston	31⅞	31	31⅞	My.1, Je.1 Q	1.00
Mother Lode Coa.	New York	6⅛	6	6⅛	Jn. 15, Jn. 30	0.37½
Nevada Consol.	New York	12⅛	11⅜	12⅛	Jn. 15, Jn. 30 Q	0.25
New Cornelia	Boston	19⅛	19⅛	19⅜	My.7, M.24 Q	0.40
North Butte	Boston	2⅛	2⅛	2⅛	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*62	*58	*60	No. 14, De. 2	0.05
Old Dominion	Boston	16⅛	15	15	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†125	†119	....	Mar.20, Apr.20 Q	1.00
Quincy	Boston	17⅜	16½	17⅛	Mar., 1920	1.00
Ray Consolidated	New York	13⅛	12⅛	12½	Ap.20, Ap.30	0.25
Ray Hercules	N. Y. Curb	....	....	11⅞		
St. Mary's Min. Ld.	Boston	27½	26	26½	Ap.17, My.18	2.00
Seneca Copper	New York	5¼	4⅜	5¼		
Shannon	Boston	....	....	*40	Nov., 1917	0.25
Superior & Boston	Boston	*60	*60	*60		
Tenn. C. & C.	New York	11⅞	11⅛	11⅛	My. 29 Ju.15,Q	0.25
United Verde Ex.	N. Y. Curb	28	27⅜	28	Ap.6, My.1,	0.75
Utah Copper	New York	....	....	100	Jn.15,Jn.31,Q	1.25
Utah Metal & T.	Boston	1⅞	1⅜	1⅜	Dec., 1917	0.30
Victoria	Boston	*41	*41	*41		
Walker Mining	Salt Lake	*48	*46	*46		
NICKEL-COPPER						
Internat. Nickel	New York	36⅜	35⅛	35⅜	My.11,My.31,Q	0.50
Internat. Nickel, pfd.	New York	...	...	104	Ap.15, My.1, Q	1.50
LEAD						
Gladstone M. M. Co.	Spokane	*34½	*34	*34½	Ja. 1, Ja. 10 M	0.01½
National Lead	New York	....	....	148⅜	Jn. 11, Jn. 30 Q	2.00
National Lead pfd.	New York	117	117	117	My.21, Je.15 Q	1.75
St. Joseph Lead	New York	40⅞	39	40½	Je.10, Je. 21 QX	0.75
ZINC						
Am. Z. L. & S.	New York	7⅛	7	7	May., 1920	1.00
Am. Z. L. & S, pfd.	New York	31⅛	30⅛	31	Nov., 1920	1.50
Butte C. & Z.	New York	5	4⅜	4⅜	De.10, De.24	0.50
Butte & Superior	New York	11⅜	9⅛	11	Jn.15, Jn.30 Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Eagle Picher	Cincinnati	27⅛	26⅛	27⅛	My. 15, Jn.1	0.40
Eagle Picher, pfd.	Cincinnati	....	....	110	Mh.31, Ap.15Q	1.50
New Jersey Zn.	N. Y. Curb	....	....	208	Jn.9, Jy.10 Q	2.00
United Zinc	N. Y. Curb	....	....	*70		
Yellow Pine	Los Angeles	*26	*26	*26	De.8, De.18 Q	0.04
GOLD						
Alaska Juneau	New York	1⅛	1⅛	1⅛		
Argonaut	Toronto	*24½	*23½	*23½		
Barry-Hollinger	Toronto	*47	*44½	*46½		
Carson Hill	Boston	*30	*30	*30		
Consol. W. Dome L.	Toronto	*15	*14½	*15		
Cresson Consol. G.	N. Y. Curb	2⅛	1⅞	2	Mh.31, Ap.10	0.10
Crown Reserve	Toronto	*12	*10⅜	*11	Jan., 1917	0.05
Dome Mines	New York	14⅛	14	14	Jn.30,July 20,Q	0.50
Golden Center	N. Y. Curb	2⅛	1	1⅜		
Golden Cycle	Colo. Springs	1.52½	1.49	1.52½	No.30,Dec.10 Q	0.03
Hollinger Consol.	Toronto	19.35	19.20	19.35	Ju. 1, Jn. 17	0.08
Homestake Mining	New York	53	53	53	Jn.19, Jn.25 M	0.50
Kirkland Lake	Toronto	1.22	1.13	1.15		
Lake Shore	Toronto	11.50	11.20	11.45	Ju.1, Jn. 15 Q	0.10
McIntyre-Porcupine	New York	25½	25¼	25⅜	My.1, Je.1	0.25
Newray	Toronto	....	....	*35		
Night Hawk Pen.	Toronto	*7	*7	*7		
Noranda	N. Y. Curb	15⅜	14⅜	15⅜		
Portland	Colo. Springs	*50	*46	*50	Apr.6, Apr.15	0.02
Rand Mines	New York	....	....	32⅜	Fe.16, Fe.26	1.52
Teck-Hughes	Toronto	3.75	3.54	3.64	Ja. 15, Fe. 1	0.05
Tom Reed	Los Angeles	*62½	*62½	*62½	Ma.10Ma.20	0.02
Tough-Oakes	Toronto	*44	*38½	*39½		
United Eastern	N. Y. Curb	....	....	*35	July, 1924	0.05
Vipond Cons.	Toronto	1.65	1.62	1.63		
Wright-Hargreaves	Toronto	8.50	8.40	8.45	Ju.15, Jy.1 QX	0.07½
Yukon-Alaska Trust	N. Y. Curb	...	...	21½		
GOLD AND SILVER						
Carnegie Metals	Boston	....	....	17		
Con. Cortez	N. Y. Curb	....	....	*5		
Con. Virginia	San Francisco	*8⅛	*6⅛	*6½		
Continental Mines	N. Y. Curb	....	....	*45		
Dolores Esperanza	N. Y. Curb	*43	*42	*42	July, 1923	0.05
Premier Gold	N. Y. Curb	2⅛	2⅛	2⅛	Jn.18, Jy.3 Q	0.08
Tonopah Belmont	N. Y. Curb	3⅛	3	3	Se.15, Oc.1	0.05
Tonopah Extension	N. Y. Curb	*58	*47	*47	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	5⅛	5⅛	5⅛	Ap.7, Ap.21 Q	0.07½
Unity Gold	N. Y. Curb	....	....	*20		
West End Consol.	N. Y. Curb	*25	*25	*25	Mar., 1923	0.05
Yukon Gold	N. Y. Curb	*31	*31	*31	June, 1918	0.02

Stock	Exch.	High	Low	Last		Last Div.
SILVER						
Alvarado	N. Y. Curb	....	....	1	Oct., 1920	0.50
Beaver Consol.	Toronto	*78	*72	*74	May. 1920	0.03
Castle-Trethewey	Toronto	1.39	1.35	1.39	....	....
Coniagas	Toronto	3.25	3.25	3.25	May, 1924	0.12½
Keeley	Toronto	1.50	1.44	1.50	Ma. 1,Ma.15 X	0.12
Kerr Lake	N. Y. Curb	1⅛	1	1	Ap.1, Ap.15	0.12½
La Rose	Toronto	*10½	*10	*10	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	....	....	*85	Jy. 2, Jy. 15	0.05
McKinley-Dar.-Sav.	Toronto	*18	*17	*17	Oct., 1920	0.03
Mining Corp. Can.	Toronto	3.50	3.50	3.50	Ja. 16, Ja.30	0.12½
Nipissing	N. Y. Curb	5⅛	5⅛	5⅛	Mh.31, Ap.20, Q	0.15
Temiskaming	Toronto	*13	*13	*13	Jan., 1920	0.40
SILVER-LEAD						
Ahumada	New York	8⅛	7⅞	8	Jn.18,Jy.5, Q X	0.25
Alta Merger	Salt Lake	†*5⅛	†*2⅛	....	....	....
Bingham Mines	Boston	30⅛	29	30⅛	Ma.20,Ma.31 Q	1.00
Cardiff M. & M.	Salt Lake	*50	*50	*50	De.16, No.18	0.10
Chief Consol.	Salt Lake	....	....	2.90	Ap.1, My.1 Q	0.10
Emma Silver	Salt Lake	†*50	†*25	....	....	....
Erupcion	Boston Curb	1⅜	1 3/16	1⅛	Jn.18, Jy.5,QX	0.10
Federal M. & S.	New York	57	57	57	....	....
Federal M. & S., pfd.	New York	73½	72	73	My.25, Ju.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*22	*18	*20	....	....
Hecla Mining	N. Y. Curb	16⅜	16	16⅜	My.15, Je.15 Q	0.50
Iron King Mining	Salt Lake	....	....	*20	....	....
Keystone Mining	Salt Lake	*39	*38	*38	Au.12, Au.26	0.07½
Lucky Jim	Spokane	*15⅛	*13⅛	*15⅛	....	....
Mammoth Mining	Salt Lake	....	....	2.77½	Mar.24,Apr. 1	0.10
Marsh Mines	Spokane	*3	*2⅛	*2⅛	Se.15, Oc.1	0.15
Park Utah	Salt Lake	5.95	5.85	5.95	Mh.15, Ap.1	0.15
Prince Cons	Salt Lake	1.25	1.00	1.25	....	....
Silver King Coal	Salt Lake	8.00	8.00	8.00	June 2, July 1, Q	0.25
Silversmith	Spokane	*48⅛	*48	*48⅛	Apr. 1, Apr.10	0.02
Tamarack-Custer	Spokane	*35	*32	*32	Sept., 1924	0.25
Tintic Standard	Salt Lake	12.50	12.37½	12.50	Mh.1,Mh.20,QX	0.40
Utah-Apex	Boston	8⅛	8⅛	8⅛	Apr. 9, Apr. 15	0.25
Western Utah Copper	N. Y. Curb	...	...	*8	....	....
IRON						
Bethlehem Steel	New York	41	39½	40⅜	July, 1924	1.25
Colorado Fuel & Iron	New York	41⅛	39	39⅛	May, 1921	0.75
Gt. North'n Iron Ore	New York	19⅜	19	19⅛	De. 4, De. 28,	0.75
Inland Steel	New York	38⅜	38	38⅛	My.10, Je.1 Q	0.75
Mesabi Iron	N. Y. Curb	1⅜	1⅛	1⅜	....	....
Replogle Steel	New York	10⅛	10	10	....	....
Republic I. & S.	New York	49⅛	48⅛	49	May, 1921	1.50
Republic I. & S. pfd.	New York	94⅛	94	94	Jn.15, July1, Q	1.75
Sloss-Sheffield S. & I.	New York	125⅛	123⅛	123⅛	Jn.10, Jn.21 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	....	....	104½	Jn.21, July.1, Q	1.75
U. S. Steel	New York	126⅛	122⅛	126⅛	Jn.2, Jn.29 Q	1.75
U. S. Steel pfd	New York	128	127	128	My.4, My.29,Q	1.75
Virginia I. C. & C.	New York	47	47	47	Jan., 1924	1.50
Virginia I.C.&C.pfd	New York	....	....	73	Jn.1, July 2,	2.50
ALUMINUM						
Alum.Co. of Amer.	N. Y. Curb	69	64⅜	69	....	....
Alum. Co. of Amer pf.	N. Y. Curb	99⅛	99⅛	99¼	June 15, July 1, Q	0.01½
VANADIUM						
Vanadium Corp.	New York	35	34	34½	My.1, My.15, Q	0.75
ASBESTOS						
Asbestos Corp., New	Montreal	24½	23	24	De.31, Ja.15 Q	1.50
Asbestos Corp., pfd.	Montreal	79	75	78½	De.31, Ja.15, Q	1.50
SULPHUR						
Freeport Texas	New York	34⅛	32⅛	33⅜	Nov., 1919	1.00
Texas Gulf	New York	140⅜	133½	139	Jn. 1, Jn. 15, Q	2.50
DIAMONDS						
De Beers Consol.	New York	30¼	29⅜	30¼	Ja.26, Fe.2	0.23
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	4⅛	4	4⅛	....	....
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	50⅛	50	50	My.20, Je. 1, Q	1.00
Amer. Metal pfd.	New York	....	....	113⅛	My.20, Je. 1 Q	1.75
Amer. Sm. & Ref.	New York	123⅛	116⅛	122⅛	Ap.16, My.1, Q	1.75
Amer. Sm.&Ref.pfd.	New York	117⅜	117⅛	117⅜	My.7, Je.1, Q	1.75
Consol. M. & S.	N. Y. Curb	....	....	208	De.31, Ja.15	0.75
Federated Metals	N. Y. Curb	16	15⅛	15⅛	....	....
Newmont Mining	N. Y. Curb	53⅛	53	53	Mar.31,Apr.15,	0.60
Southwest Metals	N. Y. Curb	....	....	2	....	....
U. S. Sm. R. & M.	New York	38⅜	37⅛	38⅛	Ap.8, Ap.15, Q	0.87½
U. S. Sm. R.&M.pfd.	New York	49¼	48⅛	48⅛	Ap.8, Ap.15, Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Henry Sachs, Colorado Springs, Colo.

PRICE WEEK ENDED MAY 25th, 1926

Name	High	Low	Last	Last Divd. Date	Amount
Aramayo Mines (25 frs.)	81/3	79/9	80/—	May. 1926	5 p.c.†
British Platinum (£1)	6/4½	6/—	6/—	Feb. 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/6	15/1½	15/3	Feb. 1926	6 annas*
Bwana M'Kubwa (5s)	7/7½	7/1½	7/6		
Camp Bird (£1)	5/3	4/10½	5/—		
El Oro (£1)	6/3	6/—	6/1½	Nov. 1924	2½ p.c.*
Esperanza (10s)	1/4½	1/1½	1/4½		
Frontino & Bolivia (£1)	8/9	7/9	8/9	Jan. 1926	1½ p.c.
Mexican Corpn. (£1)	17/3	15/9	16/6		
Mexico Mines of El Oro (£1)	31/3	30/—	30/—	Dec. 1925	12½ p.c.*
Oroville Dredging (£1)	4/—	3/6	4/—	Dec. 1923	3½ p.c.
Ouro Preto (£1)	2/3	2/—	2/—	May 1925	2½ p.c.
Rhodesian Congo Border	111/10½	105/—	107/6		
St. John del Rey (£1)	8/3	7/9	8/3	June 1925	6½ p.c.
San Francisco Mines (10s)	28/—	27/4½	27/9	Jan. 1926	22½ p.c.
Santa Gertrudis (£1)	21/6	20/3	21/—	July 1920	5 p.c.
Selukwe (2s. 6d.)	11/9	10/10½	11/—	April 1917	6¾ p.c.
S. Amer. Copper (2s.)	4/9	4/6	4/6	Nov. 1917	75 p.c.
Tanganyika (£1)	41/6	37/6	40/—	Sept. 1925	5 p.c.
Tomboy (£1)	3/6	3/3	3/6	Jan. 1926	5 p.c.
Union Miniere du Haut-Katanga (Brussels)	6.600	6.310	6.500	July 1925	150 frs.‡

* Free of British income tax. † Swiss frs. ‡ Belgian frs.